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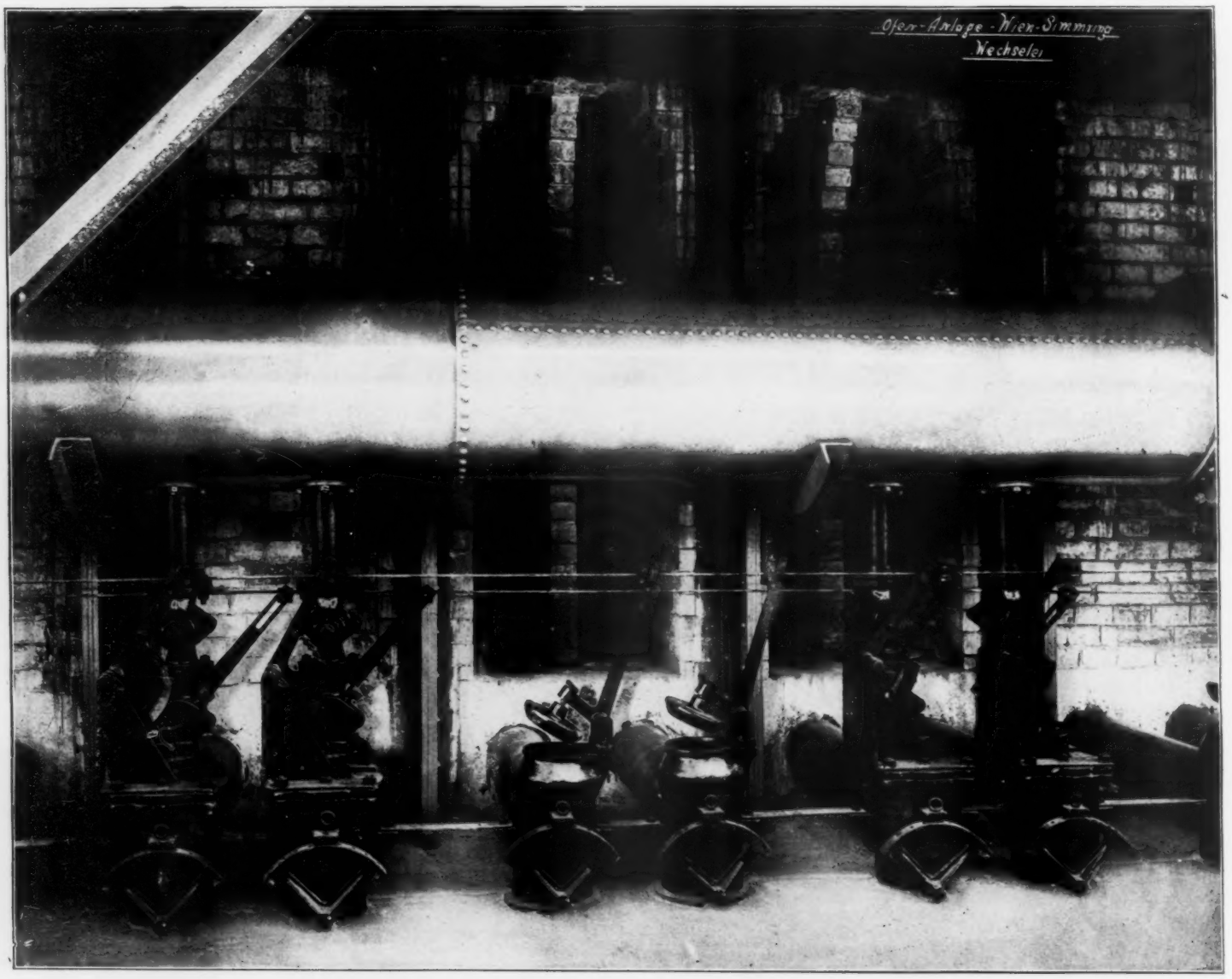

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THE AMERICAN GAS LIGHT JOURNAL

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Gas Power With and Without Ammonia Recovery.

[Communicated by MR. THOMAS MORGAN.]

The state of perfection now reached by large gas engines is such that their selection in preference to steam engines is, to a large extent, decided on big considerations of power—generation costs. The main objection which can be raised to a gas engine installation is the relatively large capital outlay, against which may be placed the undoubted economy of fuel. When the plant is kept well loaded up day-by-day as in textile works, the objection of high capital cost loses most of its force. Under these conditions the maximum economy of fuel is obtained. On the other hand, should the engine be lightly loaded, even although it may be running for long periods at a time with short breaks, credit for fuel economy cannot be claimed, and the running cost may approximate to that of a steam engine. When comparing gas engines with steam power, it is necessary to take into account such items as water, stores, labor and repairs; some or all of which may become of very considerable importance. An important saving results from ammonia recovery, arising from long-period loads, but when inferior loading is the rule, the additional outlay of capital and the labor charges, together with the larger consumption of fuel, may more than counterbalance the economy arising out of the recovery of the by-product. Under such circumstances it is more economical to install a non-recovery plant. For the purpose of critically examining the advantages and disadvantages of gas engine plants, and obtaining an unbiased opinion, several types of installation are discussed in detail below.

Let us assume five standard, horizontal, tandem gas engines driving electric generators, mounted directly on the engine crankshafts; four of the engines working, the fifth being a spare one. In the case of public electric supply stations, this is frequently a necessary condition; but in industrial installations it is becoming more and more usual to maintain all the engines in service as continuously as possible; a reasonable proportion of spare parts being kept in stock, so that all ordinary repairs can be carried out without losing more than 1 to 3 per cent. of the possible working hours. This practice of eliminating the spare engine reduces the cost of the whole installation very considerably, and in many cases leads to a marked decrease in the gross power costs. Let us assume that each of the five engines mentioned above delivers from 800 to 1,000 kilowatts, the normal output averaging 850; that will yield 3,400 kw. for the four active engines. The capital outlay may be estimated as follows, the amounts being those applicable for Europe; for comparison with the United States additions may have to be made, to allow for the higher wages earned by the men and the consequent larger cost of material:

1. Engines, etc., with pipework.....	$275,000
2. Switchboard and appliances.....	12,000
3. Power house complete.....	35,000
4. All other outlays	24,000
Total	$346,000

In different schemes there may be slight variations of capital outlay, due to continuous current generating units being cheaper than alternating current; there may be also variations in the switch gear and so on, but they may not vary the figures given above to a greater extent than 10 per cent. if so much. Buildings of the class required may be generally erected at a cost of 6 cents per cubic foot in Europe, and probably somewhat more in America, unless the site is such as to require an abnormal amount of carting, and there are exceptional conditions, such as bad foundations, or difficulties of levels. The outside dimensions may be taken at say 75 by 142 feet, the height with a low pitched roof averaging 48 feet. To the above must be added the capital outlay for the gas plant, which may be of two types: (a) An ammonia recovery; or (b), a non-recovery type. The cost of the former may be taken at $113,000, of the latter, $75,000. The larger outlay would be found desirable for works requiring a steady load day and night, throughout the year, as for instance—chemical works, or for electric supply stations, generating alternating current, with good load factor. The smaller outlay would be more suitable for an electric supply station generating alternating current with a poor load factor; or, for textile works, requiring continuous current, entirely a day load. Engineering and boiler shops could be grouped with these, as they are also generally worked during the day only. The total capital outlay for the engine plant and gas plant would be $459,000 with recovery, or $421,000 without.

With regard to details, in a scheme with a steady load day and night the whole year, the costs would work out as follows for the gas plant:

Outlay.	Value.
For coal	$60,000
Wages (thirty-six men)	12,000
Salary of chemist	1,200
Stores, repairs and maintenance	7,500
Acid and packing	8,600
Interest and depreciation	10,600
Total expenses	$99,900

RECEIPTS.

Sulphate recovered, 893 tons	$55,680
Tar recovered, 1,250 tons	3,000
Total receipts	$58,680

Deducting $58,680 from $99,900, the net gas plant costs would be $41,220. In the case of the engine house, in each shift the labor would be—

One leading driver	$720
One driver	480
Two greasers	1,200
Total	$2,400

For three shifts three times this amount would be $7,200; but it does not include labor on repairs and maintenance, which may be reasonably taken at 1¼ per cent. on the total capital outlay. In addition to the above there are the following other charges:

11,000 gallons of oil	$4,400
Stores	1,000
Water, 12,000,000 gallons	1,000
Total other charges	$6,400

Combining the gas and engine plants, the total costs per annum work out as follows:

Gas	$41,220
Stores	6,400
Labor	7,200
Maintenance and repairs	4,200
Depreciation and interest	28,100
Total	$87,120

Should only four engines with spares be installed, the cost would be somewhat reduced. From the above figures the cost per unit, in decimal points of a cent, can be readily worked out. Experience has shown that the following data may be taken as a basis of the above figures. The cost of coal must vary. In the United States it will be less than in Europe, where it will average $2.40 per ton. Oil may cost 36 cents per gallon, and 0.35 gallons per engine per hour may be required. Stores may cost one-fifth as much as oil. Water will vary with every locality. Experts generally work out estimates with a separate cost for the gas plant, so that, in effect, the engine is charged with the cost of gas and not of coal. Such system is desirable owing to the influence of by-product recovery costs and returns. The heat value per pound of coal may be taken at 13,500 B. Th. U.; the recovery producer-efficiency is 55 per cent. The heat in gas per pound of coal gasified is in the recovery producers, 8.780 B. T. U.; for non-recovery producers, 9.720 B. Th. U. The evaporation of the gas plant boilers per pound of coal is 5 lbs., if the gas is fired from the producers, and 7 pounds when coal fired. In the estimate given above it has been assumed in the recovery gas plant that four engines run 350 days per annum, with an average total load of 3,400 K-w.; giving an annual output of 28,550,000 units and a plant load factor of 76 per cent. There are estimated to be 14,500 B. Th. U. in the gas per K-w. hour. Consumption of coal 25,000 tons annually. The sulphate recovered would be 80 pounds per ton of coal, and the tar recovered 112 pounds.

In the case of an electric supply station generating alternating current, with a good load factor, the details would be somewhat different. Assuming 365 days run per annum, with an average load of 2,500 k.w. and an output of just under 22,000,000 units, the plant load factor would be 59 per cent., and the number of B.T.U.'s per k.w. hour, 17,000. The total coal per k.w. hour, including that required for the producer boilers, 2.42 pounds, and total per annum, 24,000 tons. The sulphate recovered would be 70 pounds per ton. The accounts will then stand thus:

Items.	Value.
Coal	$57,600
Stores	6,700
Labor	12,000
Acid and packing	6,700
Interest and depreciation	10,500
Total outgoings	$93,500
Sulphate, 747 tons	$46,300
Tar	2,900
Total receipts	$49,200
Cost of gas—net outgoings	$44,300

The total costs of alternating current with a good load factor will, therefore be as follows: Cost of gas, as above, $44,300; stores, labor and administration, $17,300; repairs, maintenance, interest and depreciation, $33,700; total, $95,300. When the load factor is a poor one the details are again different. The average load may be taken as 750 kw., as compared with the 2,500 kw. above, and the output at about 6,500,000 units, more or less, B. T. U. per kw. hour, 20,000. Coal consumption per annum, 10,700; sulphate recovery, 60 pounds per ton. The gas costs, then, for coal, stores, labor, acid, packing, interest and depreciation will amount to $53,700, the total expenses; whilst the total returns for sulphate and tar will be $19,200; leaving a net cost of $34,500. With a non-recovery plant the coal consumption per annum will be slightly over 6,000 tons, a difference of 4,700 tons, and the total expenses $25,500. The total cost, including the same items as above, would be $71,300.

For large works requiring continuous current, mainly day load, the essential details would be: Running 50 weeks annually, with a day load, 55 hours per weeks, 2,000 kw., and a night load of 500 kw. weekly; giving a day load output of 5,500,000 units, and a night load of 1,875,000 units, total, 7,375,000; B. T. U. per kw. hour, day load, 18,000, and night load, 20,000. The gas costs for a non-recovery plant would be $26,000, and the total generating costs, $63,000. In putting these details into practical use, it should be noted that the price of coal varies in different localities, that the yield of ammonia depends on the nature of the coal, good management is essential, and when the load is a variable one, each running engine should be well loaded up.

Gas Service Regulation in New York.[1]

A Description of the Powers, Organization, Equipment and Methods of the Gas Department of the New York Public Service Commission, Second District; by MR. C. F. LEONARD, Chief Inspector of Gas.

The "Up State" Commission has supervision over 198 concerns that sell gas. Of these, 89 corporations sell coal gas and water gas, 59 natural gas, 32 acetylene, and 18 gasoline gas. About ½ million consumers are supplied. Of these about four-fifths use artificial gas and one-fifth natural. However, about twice as much natural gas as artificial gas is used in the Second District. The consumers of acetylene and gasoline gas number less than 2,000.

Legal Regulations.—All gas meters are subject to inspection. They may not be installed unless tested and sealed by the Commission. A meter testing within 2 per cent., fast or slow, is regarded as correct. A consumer on application can have a gas meter tested by the Commission on the payment of a fee, which is usually 75 cents. In case the meter registers more than 2 per cent. fast, the fee is refunded to the consumer.

Only coal gas and water gas are required to conform to standards of quality and purity. The candle power requirements are: For coal gas, 16; mixed gas, 18; water gas, 20. Freedom from hydrogen sulphide is insisted upon, and ammonia is restricted to 10 grains and sulphur to 20 grains per 100 cubic feet. In the second class cities—*i. e.*, communities of over 50,000 inhabitants—a pressure somewhere between 1.5 and 3.75 inches of water is required in the mains of the distributing system, plus an allowance at the rate of 1 inch for variation of each 100 feet of increase in altitude in the distributing system between the holder and point of consumption, except that no maximum pressure is prescribed in service mains, the pressure of gas from which is regulated by service governors, supplied and maintained without charge to consumers.

1. "Public Service Regulation."

The inspection force consists of a chief inspector, four assistant gas inspectors, and seven gas meter inspectors. New York State covers 47,000 square miles, which makes it necessary to center one inspector at Rochester to look out for the gas tests in the western end of the State. Another gas inspector makes his headquarters in Mt. Vernon, who takes care of Long Island and the region north and west of New York city; so, too, with the meter testing: One man is kept in Syracuse, Rochester, Buffalo, Jamestown and New York City, respectively, to take care of contiguous territory, while the chief inspector, two gas inspectors and two meter inspectors make headquarters at Albany, look out for the central and northern parts of the State, and help in other sections when necessary.

Gas Laboratory.—This term is applied to the suite of three rooms on the third floor of the Lyon Block, in Albany, which is used as general offices and for gas testing. There is also a meter room on the second floor for meter calibrations.

The equipment of the laboratory consists of a Hempel gas analysis apparatus, with mercury seals, an Elliott gas analysis outfit, an 80-inch closed bar photometer, a calorimeter cabinet with overhead tank, equipped with the primary and secondary standards, a gas holder of 50 cubic feet capacity, chemical balances and other appurtenances, which usually go with a chemical laboratory for qualitative and quantitative analysis.

The meter room contains a standard cubic foot, a prover, a machine for stamping out badges, and another machine for numbering them. In addition, there are soldering and other tools for repair purposes.

When an inspector arrives at a gas company's office, he lets the gas blow out of the line to be sure that he is dealing with a fresh supply. He then lights the jet in the bar photometer, unpacks his kit (*B*, Fig. 1), and sets up his sulphur and ammonia apparatus.

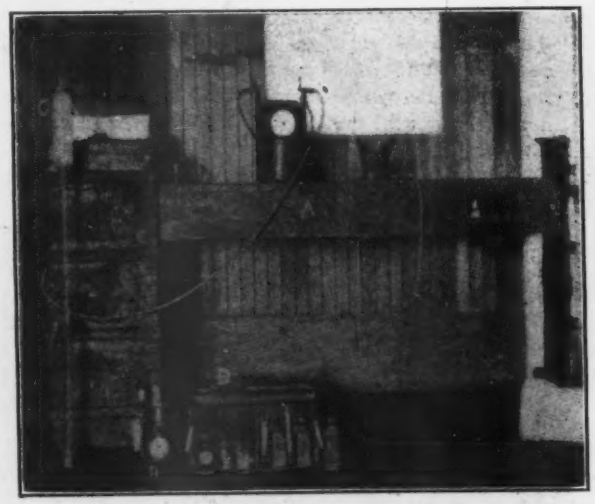

Fig. 1.—Kit Used in Tests at Producer's Office.

Candle Power.—As a photometer depends on the principle that the intensity of light varies inversely as the square of the distance from the source, therefore, if the flame to be measured is placed 80 inches away from a candle in a dark room, with a scale graduated on the principle of inverse squares between, a sight-box containing a paper disk, moved along the scale, will at some point show just as much light on one side of the paper disk as on the other. The candle power is then read directly off the scale. However, to secure results that are comparable, it is necessary that the gas burn at the uniform rate of 5 feet per hour, that it be measured in a meter at a temperature of 60° F. and 30 inches barometer pressure, that the candle burn at the rate of 120 grains of spermaceti per hour, and that the ventilation be good and free from draughts. As in experimental work it is usually possible to reach only a close approximation to these standard conditions, corrections have to be made for the speed of the meter, temperature of gas, barometric pressure and the candles. Instead of having an open bar in a dark room, a closed bar, as shown at *A*, Fig. 2, is quite generally used to save space. Here two candles are hung on a delicate balance at one end of the bar and a gas flame is shown at the other end. In between is an elongated box, painted a dull black on the inside and provided at frequent intervals with screens to prevent reflection. In using this instrument it is merely necessary to pull the curtains of the room, or if it happens to be placed in a dark corner even that is not necessary.

All the large companies are provided with bar photometers. However, for the smaller companies which are unprovided the Commission uses a portable bar that folds up in a trunk. (*A*, Fig. 1.)

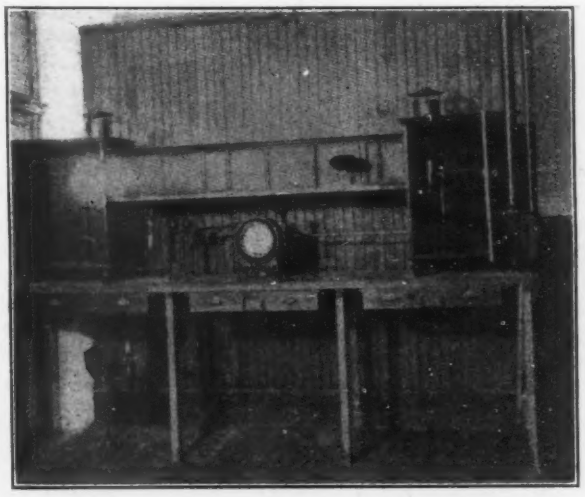

Fig. 2.—Photometric Apparatus Used by Commission's Inspector.

Pressure.—This is determined by a U gauge and merely registers the pressure at the time the inspector is present. Where there is complaint of poor pressure the department has a registering gauge which gives a 24 hour chart, showing a continuous record. (Fig. 3.)

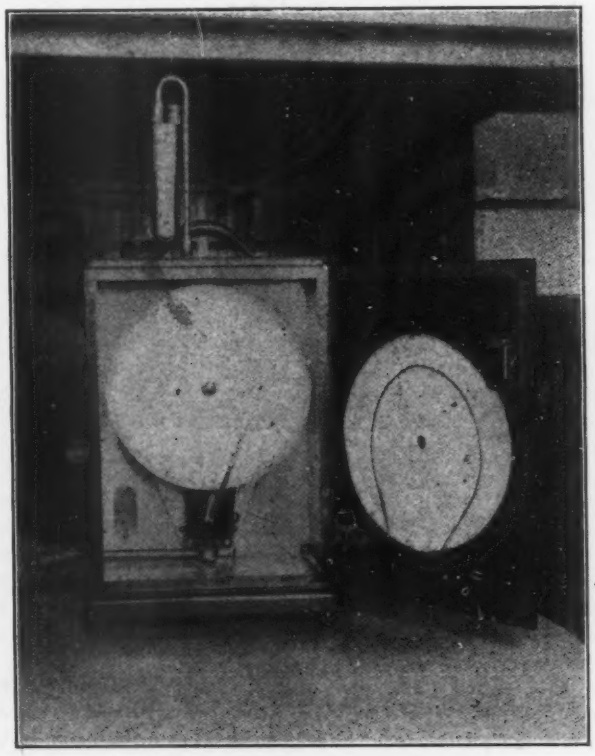

Fig. 3.—Outfit for Obtaining 24-Hour Pressure Record.

Sulphur.—This test consists in burning the gas, collecting the products of combustion, oxidizing the sulphurous acid to sulphuric acid, and determining the latter by a volumetric method. The products of combustion, as they rise from the small burner at the bottom, are chilled by the bead glasses (*C*, Fig. 1) at the top, and, dripping down the sides, are collected in the small flask hung about half-way up the apparatus. This condensate is put in a bottle and, with similar bottles from other places, shipped at the end of each week to Albany for chemical analysis.

Ammonia.—Gas is passed at the rate of 0.6 cubic feet per hour through a standard solution of hydrochloric acid which has been colored with cochineal. The acid is made of such strength that 1 c.c. equals 0.001 grain of ammonia. As soon as the ammonia in the gas has neutralized the acid in the bulb (*D*, Fig. 1), the color of the latter will change from a yellow or orange to a deep purple. At the moment when this change of color has affected the entire solution, the meter is read and the test is finished. The acid is of such a strength that, if this change of color occurs after the passage of 1 cubic foot of gas, the latter contains exactly 1 grain of ammonia per 100 cubic

feet. The final result is, therefore, easily determined by a small computation.

Hydrogen Sulphide.—A very simple, but nevertheless a very delicate, qualitative test, determines this. A piece of white paper moistened with sugar of lead, on exposure for 30 seconds to a current of gas which contains hydrogen sulphide, will be stained. The regulations demand the entire absence of this impurity. If there is no stain, the gas is free from it.

Meter Testing.—Something over 100,000 consumers' meters are tested annually. Of these over 40 per cent. are new, the remainder being "repairs." The meters are permitted to stand in the testing room for at least 12 hours before testing to insure their being at the same temperature as the prover. The water sealing the prover and the room temperature should correspond within 2°.

The meter inlet is first connected to the prover (*A*, Fig. 4), by a

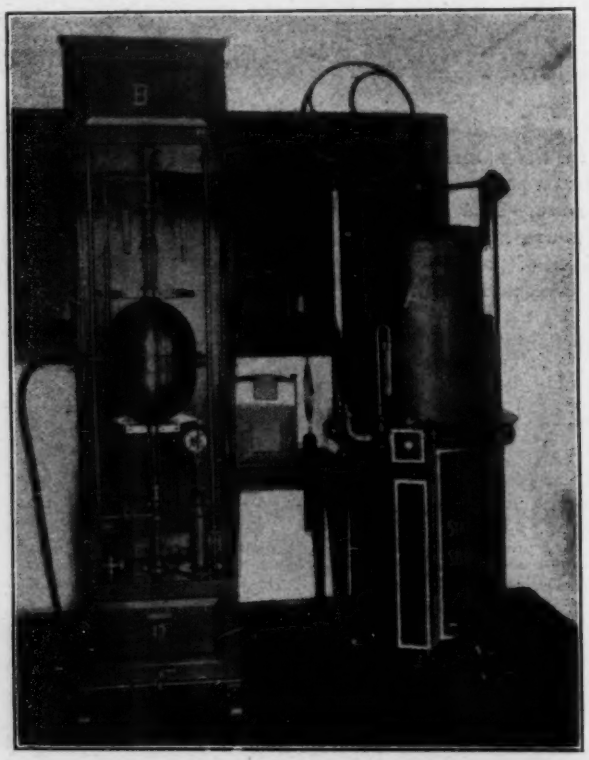

Fig. 4.—Equipment for Testing Consumers' Meters.

rubber hose. Test is made for leaks in the meter or connections. A little air is passed through the meter to permit it to assume its normal rate of action before commencing the test, and to insure that nothing but air of room temperature fills the diaphragms when the test begins. The testing circle of the meter is the small one in the center of the upper portion of the dial. The meter may be tested with open outlet, but the generally accepted legal test is made with the rate or speed union on the outlet. The speed unions for different sizes of meters have such apertures, that, with the pressure of 1½ inches thrown by the prover, the meter should pass gas at the rate of as many tenths of a cubic foot per minute as the meter has lights. Thus the rate for a 5-light meter, the size most commonly used, is 0.5 cubic foot per minute, or 30 feet per hour.

The bell of the prover is now raised until the pointer is a trifle above the zero mark on the side. The valve leading to the meter is opened and sufficient air passed through to cause one complete revolution of the test hand on the meter. The percentage, fast or slow, is then read directly from the prover scale. There are a number of small but important details of manipulation, other than those already mentioned, which are necessary for accurate work.

Prover.—A prover consists of a copper bell inverted in a circular tank which contains water. The water acts as a seal for the air in the bell. The air is admitted and emitted through a valve governing a pipe which stands up from the bottom of the prover through the center. The bell is counterbalanced by two weights, one of which travels over a cycloidal curve. This automatically compensates for the buoyancy of the bell at different heights in the water and thus maintains an even pressure. Provers usually hold from 2 to 5 cubic feet of air.

The scale on the outside of the prover is calibrated by the use of a standard cubic foot. All provers used for meter testing are required to be sent to Albany for testing and sealing. An arrangement is made with a meter factory in Albany for the use of a room specially designed for testing provers. Devices for producing artificial humidification of the air used in the calibration are important features of this room.

The standard cubic foot is made of copper, as shown at *B*, Fig. 4. The tanks at top and bottom hold water. A hand pump is connected to the bottom one. The room is provided with wet cloths by which the air is humidified. The cubic foot is first filled with water. When a prover is to be tested the bell is raised to the zero point. Air is sucked over from the prover into the cubic foot as water runs out of the bottom of the latter. Any number of cubic feet are thus readily marked off on the prover scale by simply repeating the process. This standard cubic foot, which is the Primary Standard for meter testing in the Second District, was calibrated by the Bureau of Standards at Washington.

Wet Meters—These are laboratory instruments for use where accurate work is required. They record the one-thousandth of a cubic foot and are standardized against the standard cubic foot. Their chief use is in photometric and calorimetric observations. (See *A*, Fig. 5.)

Calorimetry—Three years ago the Commission made a calorimetric survey of the gas of the entire State. This survey comprised a test of the gas of each company during each of the 4 seasons of the year. This preliminary work was followed by the appointment of a Joint Committee on Calorimetry, upon which the companies and the Commission are both represented. This committee is actively engaged in getting data. The Commission has put its laboratory and inspection facilities at the disposal of the committee. Companies purchasing calorimeters, for purposes of participating in the inquiry, first send them to Albany with their appurtenances, where they are tested against the primary standard, which in turn is calibrated by the Bureau of Standards. Re-calibrations of these calorimeters are made *in situ* afterward at the gas works of the various companies, using the portable secondary standard, which is kept standardized by use of the primary standard. Re-calibrations for the present are made about once in 3 months. Monthly reports are made by the companies to the committee, tabulated and studied.

A Junkers calorimeter is shown at *B*, Fig. 5. The secondary standard

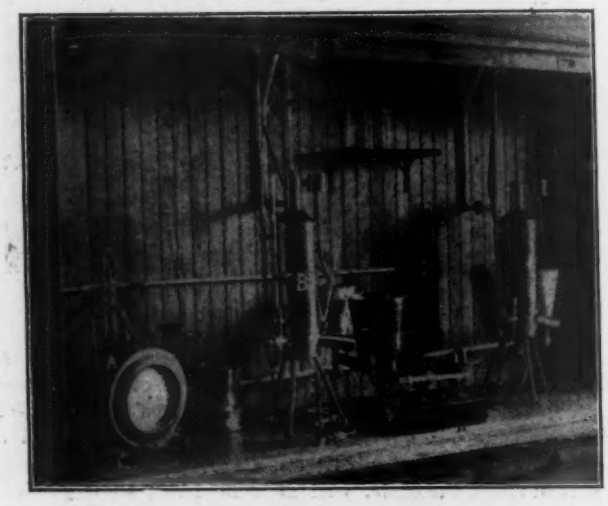

Fig. 5. Precision Instruments in Commissioner's Laboratory—Final Authority on Questions of Measurement.

is of the same type. An instrument of this type will commonly absorb over 99 per cent. of the heat it receives from the Bunsen flame in the interior. The principle is quite simple. Water, about 7 pounds, passing in at the bottom and out at the top, is heated a certain number of degrees, usually about 15. The water is weighed very carefully in a fine balance. The temperatures at inlet and outlet are noted by specially made thermometers graduated to tenths of a degree. The gas burns at the rate of 6 feet per hour. As a British thermal heat unit is the amount of heat required to raise 1 pound of water 1° F. the weight of water times the number of degrees rise gives the heat units for the amount of gas consumed. It is thus a matter of computation to determine the heat units in one cubic foot of gas, making due allowance for corrections due to humidity, temperature and pressure of gas, efficiency of instrument and barometric pressure.

It is probable that the gas standards of New York State will be recast in the near future.

[Continued from Page 75.]

FOURTH ANNUAL MEETING, SOUTHERN GAS ASSOCIATION.

Held in the Seminole Hotel, Jacksonville, Fla., April 17, 18 and 19, 1912.

Second Day—Afternoon Session.

Discussion on the De Frese Paper.

The President—Gentlemen, the paper is open for general discussion. Mr. Dexter, from Columbus, Ga.?

Mr. Dexter—I, for one, want to express my appreciation of this subject. It is the first paper, I believe, of this class that we have had, and it deals with a subject that is one with which I have had some experience. I have had a sort of fellow feeling for a gas man in the South who has been through a period of prosperity, when there is an active demand for negro laborers, and trying to run a small plant with a small storage capacity; and the smaller the plant, the harder the problem. The smaller the crew, the greater the responsibility to get any one. Usually in a small town labor is hard to get. With people like these, as Mr. De Frese says, after payday or Saturday night, when the peakload is the biggest, he finds one or two of his men absent, and he doesn't know where to get another one, especially when labor is scarce, and he hasn't an extra man. It is an experience we have all been through, but, fortunately, we have not had as much trouble in my home town during the last few years as we had some years ago when labor was scarcer. I certainly agree with Mr. De Frese that a competent white foreman is a most essential thing, and that with discipline, rules and firmness, you can get a reliable, strong and skillful negro force. Another thing that appears to me equally essential as a good man is that a retort house laborer has to be well paid. At home I have seen common labor vary between $1.75 and $1.50, with retort house labor in like proportion. I believe, in looking back over times when we had most trouble, we will find we had our trouble increased when we had the lowest ratio of pay as to common and retort house labor. This subject is one that can be written about again and again, and every one in his writing will add something of interest to us. I would like to see statistics as to what this ratio is in different cities. I presume that common labor here is about $1 to $1.25?

Mr. DeFrese—$1.35.

Mr. Dexter—When building was very active with us labor has gone to $1.50, when I was paying $1.50 in the retort house for it. I have had my share of troubles. As to the possibility of making the negro a reliable, hard and skillful laborer. We had a few examples of reliability. One negro worked 30 years in our retort house, and when he quit (largely through age) he had accumulated, by building and loan, about $8,000. We have had others who owned farms and often drove to their work in a buggy. Last summer, the S. H. Kressge Company (the 10-cent people) built in our city, representing an investment of over $110,000. They also built a dozen shops in prominent cities in the South, and offering prizes to the contractor for speed and results as to the construction. It was to be the standard, and the contractor who erected the Kressge Building in Columbus got the prize. In the erection of that building not a negro was employed save the men who did the gas piping, electric wiring and steam heating. We all agree it is preferable to have one white foreman in a gas works, but in a small plant it is questionable whether one should have a white man at night. I would rather have one of the negroes act as a foreman, not giving him any authority other than to simply transmit to the other men instructions from the main foreman. That is, to be a head to whom one could give orders and to whom the others would look for directing. I would rather have that practice in a small company than to have a mean white foreman. I am very glad to notice the preparation of papers of this class, and hope we shall have others.

Mr. Congdon—I made a note here with reference to retort cement. About 6 years ago we got a very good retort cement that cost us only 2½ cents per pound. The natural material comes from somewhere near New Orleans. If anyone is interested in that and will write to me at Atlanta, I will get you the name and address. I have been using this now for 6 years, and it is very, very serviceable. I believe that Mr. DeFrese speech, in reference to giving your men a rest, refers to a very important matter. No human being can be expected to work 365 days in the year. Unless we provide resting time for them, we can't expect constant work. Mr. DeFrese spoke of drawing coke into a self-quenching chute. What does he mean by that? You mean the hoppers under the floor?

Mr. DeFrese—No; it is one we made ourselves.

Mr. Congdon—Well, the hopper under the floor, made of metal, deteriorates according to my experience, rather rapidly. Wherever hot coke and water and metal come together there is much warping of the latter. Mr. McDonald (of Louisville) has a patent on a hopper, which goes under the floor, into which the hot coke is drawn. The lid is then put on the top through which the coke is discharged, and water is turned on it; but we find, in endeavoring to quench the coke, in order to save the hopper from burning, we had to practically drown the coke. It's bound to angle, so there are some hot places which the water won't reach, and the metal is there twisted. The wear and tear on the hoppers was very great. We then made them of angle iron and firebrick. We have hoppers in use that have practically had no repairs for 3 years. Those were very serviceable, with the exception of the bottom door. There again you have the heat and the water and the metal, and that bottom door would warp. We then put in a water-sealed door on the bottom of that hopper which continues in excellent condition. Water is put into this pan at the base of the hopper, the coke is drawn into the hopper and closed up; the hopper is closed. By the admission of enough exhaust steam to keep the air from leaking in between the crevices of the brick, you can smother the coke out and get it practically dry; or, if you want to put water on it, the steam will not get away from the coke as rapidly as would be the case in the absence of that water-sealed door; for, without the latter, certain openings are due to the warping, so the hopper becomes a chimney in a sense, through which air rushes through, carrying steam on it. This form of hopper, developed by Mr. McDonald and ourselves, has proved very satisfactory. I have had considerable experience with negro labor before I ever came to Georgia. It has been my endeavor to get rid of the negro labor as nearly as possible. Some years ago I put a white man helper in our water gas plant, and in the afternoon the two water gas negroes asked me if he was to remain there. I said "Yes." They replied, "We will quit." Said I, "All right; quit." Later on four of them asked me about that white man, and they said they would all quit. I replied, "All right; quit." I operated two machines myself, with the white man as a helper. That was 5 years ago. We have not had another negro in that generator house since. White men are more intelligent, so we have been able to get much better results, and I wouldn't go back to the negro labor in the generator room for anything. In the retort house we have a regular little "dark town." The generating plant consists of 22 benches of full-depth 9's, which, being operated at once, means 22 "niggers" on the operating floor. In addition the niggers bring coal from the shed and look after the fires; they are on top of the stack to look after the main, and other colored persons look after the coke. Naturally I am interested in new sorts of coal gas apparatus and in methods of coal gas manufacture, and believe it would pay those who make coal gas to study carefully the various mechanical appliances now on the market for handling coal. While talking with Mr. Forstall, Consulting Engineer, not long ago, he recommended for a small plant a full retort with the small machine made by the Isbell-Porter Company for charging and drawing-retorts. We are building full-depth, horizontal retorts to replace the stub-end ones, and we selected the horizontal type after careful consideration of inclined and vertical systems. I hope about mid-August to watch the negroes leaving my works like rats deserting a sinking ship. In England last summer I inspected the charging and drawing machines in the Great Beckton gas works, and also visited Guildford, England, where I saw the charging and drawing machine in which I was particularly interested in use. On entering the plant, no one could be seen, neither white nor black. Shortly a whistle was blown, and men from other parts of the works, who had been engaged in differing tasks came in and drew and charged the retorts. One man got on this machine. moved it a few feet (the coal was automatically taken from an overhead bin), opened up the retort lids, put the machine in operation, charging 1,300 pounds into the retort, the same stroke pushing the coke out on the other side, the coke being handled on the other side by two men. An overhead electric car carrying a hook grabbed the filled coke basket. The coke (pushed down into this basket) is let down into the yard, lowered into a tub of water, raised again, taken around and laid on the ground. Four men charged and drew the coal on that occasion and handled all the coke. In Atlanta we can, with 3 men on the operating floor, charge and draw the entire house. The coal is brought into the house from the shed on a conveyor, and this charging and

drawing machine will push out the coke and put in the coal at the same stroke, the coke falls onto a conveyor, on the other side of the stack, which conveyor operates in either direction. Moving towards the coal shed it drops the coke into a re-inforced concrete bin from which the workmen draw their supply. No handling, or manual labor account, is required there. Operating the conveyor in the other direction deposits the hot coke into water-cooled buckets, mounted on a Hunt industrial track, and pulled by a small electric storage battery locomotive, which passes by the "mouthpieces" of the three water gas machines above. In our case I believe it possible to operate all three machines without a helper, that storage battery locomotive being the helper for all three machines. To reclaim coal from storage, when no coal cars are coming in, we have a Brown electric hoist and grab bucket to take it up to the hopper through which the coal passes to the conveyor. Of course, we appreciate that all coal gas companies in the South cannot afford to put in this systen, but, as said at the start, I believe it will pay to investigate this matter carefully to see if machine handling won't enable you to actually operate more economically and more efficiently, besides ridding you of this negro labor proposition. In addition to saving about $90,000 a year in labor, we get a much better grade of coal tar, from the fact that the retorts can be filled practically full. No space is left over the rake, our ammonia results should be better, and the candle power should be higher. The charging machine to which I refer (the Fiddes-Aldridge combination charging and drawing machine) has not found favor in this country, although it is a machine which requires little up-keep. It operates with a 13-horse power motor, and all the inquiries I made in England demonstrated to me that it is the best charging and drawing machine on the market. The interest on the cost of that machine isn't much as compared with the cost of men, and although it may seem a large investment for a small company, I believe it would pay even these to consider it carefully. Next year we hope to have all the apparatus in working order, and I will prepare a paper for the Association showing results of operation. We estimate we can pay for the whole thing in less than 3 years. We put in 5 horizontal, full-depth benches, a coal conveyor, crusher, electric cranes for handling the coal from storage, overhead coal bin, charging and drawing machine, all delivered and erected, at a cost of about $65,000.

A Member—Just a minute. What would be the capacity of these benches; 12 retorts to a bench?

Mr. Congdon—Nine. The reason I selected 9 is that half our house is new, and we fired at the other half as it was very old. I wanted to get the benefit of the arches that were still good, so I selected the 9. If we were building a new house we would install 8's. We will knock out the partition walls, making through retorts of the job. They will be 21 feet 7 inches long. We make about half-and-half coal and water gas now, which reduces the size of our plant when you consider it from a coal gas standpoint, bringing it to a figure that you can more nearly compare with some of your work. With this machinery, I expect to get practically rid of negro labor. This about outlines what we are doing or proposing to do, and I will be glad to have any of you visit us when we get going. Any help we can give you through the figures that we have made up we will be glad to give.

Mr. Miller—What do you think will be the make per bench per day?

Mr. Congdon—About 225,000.

Mr. De Frese—I don't want Mr. Congdon or any other member to get a wrong impression regarding our quench chutes. I have seen the Atlanta chutes, and believe they are very good; but, without any reflection on them, let me say I laid out our coke in a different way. I think it's better to have a coke chute designed according to the angle of repose of coke. If I remember aright, Mr. Congdon's coke chutes, built out of angle iron and firebrick, are of the straight type, consequently, the coke being drawn rapidly from the benches, drops quickly, and has little chance of coming in contact with the spray. In other words, it is possible to so accumulate it that instant combustion might take place in the chutes. In order to prevent this, would require a large volume of water. I may say our prior inspection of Mr. Congdon's coke chutes was profitable to us. Our coke chutes are laid out at an angle of about 17°, and the coke falling into that chute has to fall slowly. A spray of water plays all around this chute, and the coke is thoroughly quenched with, reasonably speaking, a small amount of water. Of course, it is to be remembered there is much waste of water in quenching coke by any method; no question about that, at all. We have used these coke chutes for over 2 years, and they cost us $45 a unit. We have not spent 45 cents in those 2 years for repairs, and I will venture an opinion that, if you saw our coke chutes at a distance of 25 to 30 feet from them, and I believe, if they were painted, one could not tell which had been used and which had not been used. That is a very broad statement but our advantage is in the fact that we hold the coke in the chute and quench it when we can, not being obliged to depend on it to accumulate into a pile, and try to quench it all afterward, which happens when the coke falls quickly into the chute. Another point I want to bring out with relation to this paper is. In the South one finds many men traveling around posing as stokers. Finding differently equipped plants in nearly every place to which they go, gives a lot of us trouble, for when a nigger is trained in a certain line, he naturally becomes familiar with that plan, and it is a trifle hard, as Mr. Rushin said respecting the stupidity of the negro, for him to reconcile himself to a new plant. Many times a nigger may appear impudent to you, and you may think he is trying to work contrary to your rules; but, if you will think for a few minutes, you will note that is not always the case. It is due to his ignorance. Not having the power of conception, he acts like a mule, or just like he has been trained. I notice Mr. Parker isn't here, and we haven't had much humor this afternoon. I once asked a negro laborer his opinion of a mule and a nigger. He replied he didn't know there was any great difference between a nigger and a mule as to intelligence, with the exception, that perhaps the mule had the most sense; that was all. I didn't agree with him, but it simply went to show how he himself realizes that he is more or less stupid. We should consider these things and try to train those men not altogether as I have stated, but along standard lines.

Mr. Congdon—While considering the amusing side of the negro, let me say, two niggers were told to unload a car of coal when received. One got on top of the coal, the other pulled the chute, and negro and coal went down together, 20 feet below. Another fellow wanted to blow off his boiler—here was more stupidity. The boiler was working at 35 pounds pressure. He unscrewed a plug, and he died. Another one was working on our tar still—it was really the fault of the night foreman to allow this nigger there. He was drawing off hot pitch into a long, covered box, that was intended to be hitched up over to the still so that no air could get in as the pitch went in. The nigger drew the hot pitch into this covered box—8 feet wide, 35 feet long, and 6 feet deep—and he was standing on top of the cover. All of a sudden there was an explosion that knocked him 40 feet across the gas works yard. It was the same nigger who went through the coal, and, strange to say, he wasn't hurt badly on either occasion. He came to work the day after the explosion and said, "I went through car coal and didn't get hurt; and I was blown through the gas works and didn't get hurt; but I was drunk last night, and somebody stole my false teeth." [Laughter.]

Mr. Davis—I would like to say—I don't know it would be a matter of information to our members—ours is a medium size gas plant, with an installation of inclined retorts, 6 benches of 6's, and we operate 5 of them, 2 men day and 2 men night. On these benches we make approximately 100,000 cubic feet of gas per bench per 24 hours. That installation cost us about $5,000 per bench, including retort house and coke handling machinery. These men also handle their own coal. So here is a plant of medium size in which, while we do not exactly have machinery, our coal comes down by gravity through chutes and into the retorts, the retorts being inclined. We have a white foreman and a negro helper on the day shift, and the same on the night. I would like to say that Mr. McKinney, of Biloxi, Miss., has erected practically the same installation in a small plant, and I think that these three plants pretty nearly cover the different sizes of gas plants in our Association.

On motion of Mr. Hoyt, a vote of thanks was given to Mr. De Frese for his paper.

The Report of the Auditing Committee

was here handed in and accepted.

Report of Committee on President's Address.

Mr. Brown, of Columbia, S. C., then read the report of Committee on President's Address, as follows:

Your Committee on President's Address had a very difficult time. We found very much in it that was real, solid and substantial, all expressed in such way that it was clear and easily understood. It was practical, it was frank, it was clear, and we had a little difficulty in trying to say anything that could make it any better. We feel, however, there are some things that occurred to us which we wish to emphasize.

We indorse his suggestion that the Membership Committee hold two meetings during the year.

We indorse the President's ideas of increasing the membership of our Association, and would suggest that some consideration be given to the possibility of distributing a number of free copies of the "Proceedings" of the Association, to those companies represented in our membership. This free copy to be supplemented by practical follow-up letters.

We heartily indorse the suggestion of the President, that the members be careful at all times in the selection of able and competent officers.

We agree fully with the President's remarks on "Papers," and would suggest to the Association, the appointment of a permanent committee on "Papers;" the said committee to consist of three members. One to serve 1 year, ; one, 2 years; one, 3 years; after first year, succeeding members to be elected for 3 years. This will enable the Committee on Papers to direct the line of effort in the papers submitted.

Somebody having expressed the idea that we had a lack of manufacturing papers, our thought was to outline some way, or adopt some method so that the committee on papers (being permanent) could keep it up for 3 years and not lose the thread of it. In other words, here's a committee that serves a year. Some line of thought may be desired in papers and the full expression cannot be gotten in one single year; therefore, if we had a committee that could serve for three years, and one man was allotted a certain line of endeavor, he could continue his investigations for a period.

We especially indorse and wish to emphasize the high moral plane taken by our President in his second paragraph on "Programme" in reference to having 'a good time.' No permanent advance can be made along any other lines, either socially or in business.

We urge the adoption, as outlined by the President, for the distri bution of the useful information generally found in "Question Boxes."

We indorse the recommendation of the President in regard to advertising.

We wish to commend the President for his timely and very practical address on the matters suggested in his paper, not specifically mentioned above. Respectfully submitted,

S. W. Brown,
A. W. Young,
C. F. Zeek, } Committee.

On motion, the report was adopted.

Chairman White—One thing before we close. When in New York last February, one of the managers visited the Museum of Public Safety. A word Mr. Congdon said brought this thing to my mind. There are many appliances shown which are of very great value for the protection of life and limb and property of any company, and I hope someone will make a motion that a committee be appointed to look up that matter and obtain such information. It's all done without cost. All you have to do is to write the Museum and the Secretary will give us the material; that is, the information. We can get that for nothing, and will send it amongst our gas friends, although it is as much a gas proposition as an electrical proposition. If some one will make a motion along that line, I will be very much obliged.

On motion of Mr. Ferrier, the President was authorized to appoint a committee such as indicated.

In Re Ventilation.

Mr. Hoyt—Mr. Pierce has a resolution which he wishes considered.

Mr. Ferrier—Mr. Pierce was obliged to leave the city, but he asked me to submit this motion in respect of ventilation. The motion is:

"That the President be authorized to appoint a committee to consides ways and means to place in the hands of architects and builders information regarding the merits of gas burning appliances, their installation and location, and the features of building construction, piping, etc., necessary to permit the use of gas to the best advantage."

A motion of Mr. Dexter to so proceed was adopted.

On motion, an adjournment was ordered to 9 A.M. the following day.

Third Day—Morning Session.

The President called the meeting to order, pursuant to adjournment. Letters from Mr. George Williams and Mr. L. S. Bigelow regretting their inability to be present were read. The President called upon Mr. Ferrier to read the

Rport of Committee on Time and Place

of next meeting, which Mr. Ferrier read as follows:

The Committee on Next Place of Meeting, consisting of Messrs. Brown, Collins and myself, unanimously recommend that the next meeting be at Charlotte, N. C., on the first Wednesday, following April 15th, 1913. [Adopted amidst applause.]

The President—Mr. Collins, from Charlotte, is present. We would like to have him at least stand up so we will know him when we go there.

Mr. Collins—I wish to extend a cordial invitation to all present, and hope that we will have as good an attendance at that convention as we have this year. I hope you will all come to Charlotte, and I will try to see that you all have a good time.

Mr. DeFrese then presented the following

Report from Committee on Nominations.

The deliberations of your Committee resulted in recommending the following members for office bearers during the coming term:

For President.—Mr. C. E. White.
For Vice-President.—Mr. James Ferrier.
For Second Vice-President.—Mr. S. E. DeFrese.
For Secretary.—Mr. E. D. Brewer.
For Directors.—Messrs. M. A. Bowlin, A. D. Whittaker, A. W. Young and Roscoe Nettles.

Election of Officers.

The President—Gentlemen, you have heard the report of the Committee on Nominations. What is your pleasure?

On motion of Mr. Brown (seconded by Mr. DeFrese) the report was received and the Secretary was directed to cast the ballot for the officers, as named.

The President—Inasmuch as our Secretary is one of those named as a candidate for office, and as he has some modesty about putting the vote, I will ask Mr. Zeek to do so.

Mr. Zeek cast the ballot and thereupon announced the result.

Some Responses.

The President introduced Mr. White, who said:

Generally at this time somebody is expected to make a speech. I am not from Atlanta. I have not much to do with the N. C. G. A., and as my friend Kelley is not here to give me a lift, I am going to say that I do certainly appreciate very much this honor conferred upon me, because it is an honor to any one to be the President of any Gas Association, and especially one which has grown so very rapidly, despite that it was looked upon two or three years ago as not needed when it was first launched; but time has shown there is a place for it. We expect to go to Charlotte probably 300 strong—I believe we can get that number. We go from Atlanta to Charlotte, and there is no doubt we will take a large crowd from Atlanta.

Votes of Thanks.

Mr. De Frese—Mr. Chairman, before we adjourn, I move we give a rising vote of thanks to the past officers of the Association (particularly to Mr. Hoyt) for their tireless efforts in bringing about the best meeting that the Southern Gas Association has ever had; and one far beyond their expectations. I think Mr. Hoyt and the committees have done themselves well; and I merely voice the sentiments of those concerned in saying that we all appreciate it. [Seconded by Mr. Ferrier.]

Chairman White—This is a time for felicitation; and, as we all recognize the fact that the press of Jacksonville have been very lavish in their reports of this convention, let us include the press as well.

Mr. De Frese— Of a certainty. In fact, to all those concerned in making this a successful meeting. [Adopted.]

Minute to the Memory of Mr. J. B. Howard.

The Chairman—Mr. Ferrier has a motion he would like to make.

Mr. Ferrier—I am not going to take up much of the time of the Association, which time I know is limited, and I am exceeding sorry that stern necessity obliges us to devote this short space to the purpose in hand. It is many years since I first joined a Gas Association—the Western Gas Association—and there I formed some of the most valued friendships of my life. The other day, in a reminiscent mood, I was going over the list of friendships that commenced then, and was lamenting the diminished list; but I said: "Thank Heaven, Uncle Jerry is still with us." I am sorry to say that such is no longer the fact. The Nestor of the gas industry in this country has

(*Continued on page* 90.)

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NEW YORK, MONDAY, AUGUST 5, 1912.

BRIEFLY TOLD.

PROGRAMME FOR THE SIXTH ANNUAL CONVENTION OF THE ILLUMINATING ENGINEERING SOCIETY.—For this meeting of the named Society (to be held in Hotel Clifton, Niagara Falls, Ont., September 16 to 19) we are indebted to the courtesy of Mr. Norman Macbeth, Chairman, Convention Committee:

1. Report of Committee on Progress. This report will deal with the recent progress and developments in the lighting industry, both in this country and abroad.

2. Report of the Committee on Nomenclature and Standards, which will deal with certain definitions and terminology of illuminating engineering.

3. "Steel Mill Lighting," a report of the Committee on Illumination of the Association of Iron and Steel Electrical Engineers. To be presented by the Chairman, Mr. C. J. Mundo.

4. "High Pressure Gas Lighting," by Mr. F. W. Goodenough, Chairman of Council, Illuminating Engineering Society, London, England.

5. "The Status of High Pressure Gas Lighting," by Mr. George S. Barrows. This paper will be a collating of domestic and foreign correspondence pertaining to high pressure gas lighting.

6. "Recent Developments in Gas Lighting," by Mr. R. F. Pierce.

7. "Indirect and Semi-Indirect Illumination," by Mr. T. W. Rolph.

8. "Recent Developments in Series Street Lighting," by Dr. C. P. Steinmetz.

9. "Research Methods," by Dr. E. P. Hyde.

10. "The Problem of Heterochromatic Photometry and a Rational Standard of Light," by Dr. H. E. Ives."

11. "Reflection from Colored Surfaces," by Mr. Claude W. Jordan.

12. "Diffuse Reflection," by Dr. P. G. Nutting.

13. "A Study of Natural and Artificial Light Distribution in Interiors," by Mr. M. Luckiesh.

14. "The Physiology of Vision," by Dr. T. A. Woodruff.

15. "The Efficiency of the Eye under Different Systems of Illumination," by Dr. C. E. Ferree. This paper will be a report of a research carried on for the American Medical Association.

16. "A Proposed Method of Determining the Diffusion of Translucent Media," by Mr. E. L. Elliott.

17. "Illumination Charts," by Mr. F. A. Beuford.

18. "The Determination of Illumination Efficiency," by Mr. E. L. Elliott.

19. "An Absolute Reflectometer," by Dr. P. G. Nutting.

20. "Colored Values of Illuminated Surfaces," by Mr. Bassett Jones, Jr. This subject will be presented in the form of a series of experimental demonstrations.

21. One session will be arranged for a potpourri, during which discussions will be in order on miscellaneous phases of illuminating engineering. It is expected that this session will bring out interesting and valuable points not particularly covered by the above papers and reports.

The scenic wonders of the Falls render possible an entertainment programme which will surpass that given at any previous convention of the Society.

Inspection tours of the power houses and other wonderful development enterprises peculiar to this location have been arranged for. Reduced railroad fares will be available for delegates.

HIGH PRESSURE: HIGH EFFICIENCY?—The pressures at which artificial gas has been supplied to consumers have been successively raised in recent years and with much greater frequency than is shown from averaging up in the past decade. The gasholder, which has played the role of storage tank, pressure developer and control governor from its inception, was built to supply communities at a pressure but slightly in excess of burner requirements. Main systems, house piping and fixtures were designed upon the performance of open flame burners. These burners have operated most efficiently at a pressure of approximately 1 inch water column, and gas was distributed to meet this requirement until the introduction of the upright mantle burner, when the pressure was raised to 1½ to 2 inches. This increase was necessary for two different reasons: First, that the upright mantle burner required an increased pressure; second, because the interior piping generally found was not of sufficient capacity to adequately supply the large number of cooking appliances being installed at pressures of 1 inch or less. As the business developed and as the population multiplied, it became necessary to increase the pressures on the distributing mains, with the result that many consumers were supplied with gas at pressures of from 2 inches to 3 inches. Then came the inverted mantle lamp, which was constructed to operate best at these pressures of from 2 to 3 inches. At this rate of pressure, open flame burners required finer regulation, and countless devices have been marketed to consumers to overcome this difficulty. Maintenance companies supplying house regulators have meanwhile flourished, but these now are beginning to lose in prestige and volume of business, due to the rapid passing of the open flame burner. A still greater increase in pressures, up to 5, 6 and even 8 inches, became good practice in small communities, where the cost of large mains would be prohibitive. The foregoing has to do with strictly low pressure distribution and supply, and it will be seen that the ruling reason for increasing pressure has been one of meeting increased demands by increasing the capaci y instead of the size of the main system. Increased pressure has been and is indeed a distribution problem. The next step was high pressure distribution by the reinforcement method, where lines were laid direct to outlying points, carrying gas at from 2 to 5 pounds (56 to 140 inches) pressure. This gas passes through governors, and is released at the regular city pressure of a few inches into the regular low pressure lines connected to the gasholder. The next advance was to use the holders for storage only, and to supply all of the gas through a trunk line in which the pressure is kept at from 2 to 5 pounds, the gas being fed at convenient points to the low pressure system through regulators. While this system has been successful, it has not been adopted as rapidly as the straight high pressure system, where all of the gas in mains and services is maintained at a pressure of several pounds and an individual regulator is connected to each individual service. This last method will, in all probability, be extended very rapidly during the next few years; for, in addition to being flexible as well as efficient, it brings gas directly to the consumer at pressures up to 2 pounds and over, so that he will be enabled to take advantage of this supply and use it in the newer and more efficient types of gas consuming appliances for light and heat, which operate at 2 pounds pressure; and many prominent gas engineers are not slow in declaring that high pressure will supersede low pressure, just as the mantle burner displaced the open flame.

QUARTERLY MEETING, EMPIRE STATE GAS AND ELECTRIC ASSOCIATION.—The last quarterly meeting of the Empire State Gas and Electric Association (of which body Mr. R. M. Searle, Vice-President of the Rochester Railway and Light Company, is President) was held in Rochester, the 17th ult. On that morning about 60 of the members

met in the offices of the Railway and Light Company, and from there journeyed to the Oak Hill Country Club, where the sessions were held. The chief topics discussed were the use of electric vehicles by lighting companies, and the promotion of the electric vehicle business. The discussion was rather informal in character, although many members participated therein. A feature of the session was the elegant entertainment provided by the Oak Hill Club.

GAS TESTING.—The "Gem Gas Tester," the "Parr Calorimeter," also the "Sterling Regulators" and other specialties, are described in recent bulletins issued by the Connelly Iron Sponge and Governor Company. These bulletins are made up to fit standard 6 by 9-inch binder, and their attractiveness, as well as the merit of the goods described, assures that the pages will be read, prior to filing for further reference.

CURRENT MENTION—

MR. ROBERT E. FREEL, since 1905 on the staff of the Clinton (Mass.) Gas Light Company, has been promoted to take charge of its business. Mr. Alfred Montgomery will continue as Superintendent, although the greater part of his time will be given to conducting the affairs of the Leominster (Mass.) Electric Light Company.

MR. B. B. SPRINGER, writing from St. Louis, under date of the 25th ult., incloses the following: "The United States Circuit Court of Appeals, sitting in St. Paul, Minn., on the 23d of July handed down a decision favoring the appellants in the case of Morgan Jones and others, against the Missouri-Edison Electric Company, of St. Louis. This case first came out in court the early part of 1903. The court holds, on evidence submitted, that the distribution of stock in the Union Electric Light and Power Company, formed from the Missouri Edison and other Companies, to the holders of stock in the Missouri-Edison concern was grossly unjust, and the case is remanded to the lower court with instructions to determine the valuation of the new Company and assign to the appellants the proportion of stock to which they are entitled, unless the defendants are willing to pay to them the value of the stock, with interest thereon, and costs of suit within a reasonable time. The court, after looking over the findings of the Master, decided to lay aside the question of consolidation, which it was alleged was made in violation of Missouri laws relating to trusts. When the case was tried in the United States Circuit Court the appellants' protest was over-ruled. The suit is a result of the merger of the Missouri-Edison and other light companies into the Union Electric Light and Power Company. Morgan Jones (a resident of Colorado) was a stockholder in one of the companies to be merged, which merger became effective September 3, 1903. The new concern had a capital of $10,000,000, of which $2,000,000 was preferred, the balance being common. Jones and other stockholders in the smaller companies alleged they requested information respecting the proposed merger, but were denied it, and were kept in ignorance of how the valuation of stock was determined in making the valuation of stock in the new concern. Evidence submitted showed the valuation of Missouri Edison stock to have been fixed by appraisement, while the Union Electric Light and Power Company was assumed. It was also charged that the principal stockholders in the new concern also controlled the Laclede Gas Light Company, thereby effecting a trust in contravention of the State law."

THE Sayre-Waverly (N. Y.) Gas Company is now comfortably occupying its new business headquarters in the Wilbur House block on Parker avenue.

AN interesting and noteworthy decision was pronounced last month by the Massachusetts Board of Gas and Electric Light Commissioners, which had to do with a petition to the Board by the municipal authorities of the settlement of Groton, for permission to sell electric current at the maximum rate of 12 cents per kw. hour. The issue was in the fact that the named price is considerably under the total cost at which the settlement supplies energy to its customers, a point which illustrates the very common failing in both public and private administrations of neglecting interest and depreciation charges in carrying out lines of commercial policy. The case, to be sure, is of a type in which the physical factors involved are seemingly small, but the chief principles concerned are highly important. The settlement maintains for an electric plant merely a distributing system, standing for a net investment approximating $21,000. It supplies 69 private commercial customers, the town hall and other public buildings, and 165 fifty-watt and 19 forty-watt street lamps. The maximum price charged is 16 cents per kw. hour. During the last year the town supplied 13,172 kw. hours to its commercial customers, including public buildings, and 16,472 kw. hours for its street lights. Its operating expenses for the period amounted to $2,997, or practically 10 cents per kw. hour. All the energy taken by the town was purchased from a neighboring electric light company at 5 and 6 cents per kw. By the terms of the Massachusetts law (Revised laws, Chap. 34, Sec. 22), the method of determining the cost of electrical supply in municipal plants is set forth, and in applying the statute to the Groton case the Commission determined the total and unit expense, figuring bond interest at 3½ per cent. and depreciation at 5 per cent. This procedure added $819 on the former count, and $1,056 on the latter, bringing the total cost to $4,872, or 16.43 cents per kw. hour sold. The decision of the Board emphasizes the point that under the contract for the purchase of electricity by the town the average cost per unit will decrease with the increase of energy used, but that while the volume of business has probably not yet reached its limit, no sufficient evidence was offered to show such development in the near future as would reduce the cost to 12 cents. The Commission points out that the maximum net price as now charged (14.4 cents), is not high when the size of the town, the volume of the business, and the benefits, direct and indirect, are considered, and states that private consumers should bear their full share of the burden which the town assumes in supplying the electricity which they use, unless exceptional conditions should interfere. The decision deals with the various factors in a straightforward manner, and emphasizes the often unrealized point that a supply to private consumers for less than cost compels all other taxpayers, many of whom may be unable to obtain the service for their own use, to pay for the special advantages enjoyed only by a few. The lesson is one in elementary accounting, but it is clear and deserves wide application.

THE August meeting (held in the Society's rooms, 29 West 39th street the evening of the 1st), of the Illuminating Engineering Society, was notable for the presence of Mr. Leon Gaster, Honorary Secretary of the British Illuminating Engineering Society, who delivered a most entertaining and instructive address, which was a *resume* of "Progress in Illuminating Engineering in Europe." The lecturer was at his best, and we imagine Mr. Gaster will long remember the fraternity with which he was entertained and the enthusiasm that his well balanced story evoked.

MR. GEORGE B. SPRING, who will be well remembered by the Eastern fraternity from his connection with the Leominster (Mass.) gas and electric lighting interests, has assumed the general direction of the properties of the New Hampshire Water and Electric Power Company, with headquarters in Boston.

WORK on the gas plant at High Point, N. C., is progressing rapidly. In fact, the Messrs. Coler assert that gas will be distributed to the residents by September 10th. In order to educate the "Pointers" in respect of the merits of gas for lighting, cooking and power purposes, the Company has, through F. B. Massey, of Detroit, been conducting a series of lectures, that were well attended. If we mistake not, to the Messrs. Coler should go the credit of being the first to carry on demonstration lectures during the time the works were being constructed. It sounds like leaving the ghost out of the play; but the audiences did not so regard it, for their interest in the completion of the plant is very keen.

ON the 10th inst., the ratepayers of South St. Paul, Minn., will, in special election, vote on the proposition of granting the St. Paul Gas Light Company a 25-year franchise for the lighting of that settlement.

LAST month the Urbana and Champaign (Ills.) Railway, Gas and Electric Company, took on another power consumer in the instance of the huge factories of the Johnson Piano Company. The equipment included six 20 gallon glue pots.

AT the annual meeting of the Hadley (Mass.) Gas Company these officers were elected: Directors, R. J. Boylenton, F. W. Jennings, O. W. Brouty, E. S. Allen and F. H. Smith; Treasurer and Clerk, F. H. Smith.

FOLLOWING the resignation of Mr. H. W. Frund, General Manager, Chattanooga (Tenn.) Gas Company, the offices of General Manager and General Superintendent have been consolidated. Mr. S. E. De Frese, General Superintendent, becomes General Manager, assuming the duties the 1st inst. We congratulate the Company on its recognition of ability, and we congratulate Mr. De Frese on this larger field in which to show his ability, which latter has been pretty well displayed in his former fields.

(*Continued from page 87.*)

been called hence—Mr. J. B. Howard, of Galena, Ills. He died at the age of 82 years, and he was a boy up to his death; but such a boy as those here who have boys would wish their boys to be. I don't think anyone ever came within the genial radiance of Jerry Howard without feeling that he didn't wish to say, "Well, the world is a pretty good place after all." So I want to make this resolulion: That the Southern Gas Association has heard with profound regret of the decease of Mr. J. B. Howard, and extends its sympathy and condolence to his family. That the Secretary be instructed to send a copy of this resolution to the family. [Adopted.]

The President—Mr. Chairman, in the report of the Committee on President's Address, a suggestion was made as to appointing a Committee on Papers. I presume we will hardly have time to discuss this, but my own experience as Chairman of last years Papers' Committee, and as President this year, obliges me to believe it is an important matter. I, therefore, move that a Standing Committee be constituted, to be known as the Standing Committee on Papers, this Committee to be composed of three members, who shall be appointed by the President and who shall serve for three years, one to be appointed each year. [Adopted.]

Texas Wants the 1914 Meeting.

The Chairman—Any further business before the Association, Mr. Walker?

Mr. Walker—I am from a little State across from Mississippi; and it is called Texas. I believe I am the only representative here (I haven't seen anybody else from Texas), and want to put you on notice that Texas desires this convention for 1914. Think over it. We want you in Beaumont. We are anxious to get you there, and we can and will entertain you.

The Chairman—Mr. Walker, I want to say you will be a member of the membership committee. Texas is not as well represented as it should be—that is, as far as members are concerned; but those who come are very gladly received.

Mr. Walker—I will do the best I can.

A motion to adjourn prevailed.

Surface Combustion.

[A paper prepared for the Eighth Meeting, Iowa District Gas Association, by Mr. H. C. Blackwell, Davenport, Ia.]

Many of us who were able to attend the convention of the American Gas Institute, at St. Louis last October, were immensely interested in a very instructive and well delivered lecture on "Surface Combustion," by Prof. Wm. A. Bone, of Leeds University, England. I was not in a class by myself in leaving St. Louis feeling that Prof. Bone had made a wonderful discovery, and that some of our present methods would prove antiquated as soon as his ideas could be put into practice. I was greatly surprised when I read, in "Progressive Age," February 15th (just past), that C. E. Lucke (December, 1901) presented to the American Society of Mechanical Engineers the same ideas as those of Prof. Bone. Mr. Lucke performed his experiments in 1900 while investigating the heat engine problem.

In placing this subject before the American Gas Institute, Prof. Bone laid special stress on the fact that heretofore it had been considered, in industrial heating operations, the contact of flame with surfaces should be avoided; this idea being in direct opposition to the theory of surface combustion. The conclusion reached is that hot solids possess the power of accelerating the combustion of an explosive gas with its proper proportion of air for complete combustion, the combustion taking place without flame.

First.—A burner to make use of these ideas must consist essentially of a number of surfaces of a highly refractory material contained in a suitable chamber; and, second, an injector for supplying a suitable mixture of gas and air. This, as well as any other burner using an explosive mixture of gas and air, must necessarily be designed to prevent backfiring, which might be accomplished in three ways:

1. By using a tube so small in diameter that the flame could not strike back.
2. By using wire gauze screens.
3. By causing the mixture to flow into the combustion chamber with a velocity always greater than the rate of propagation of flame.

Of the three means mentioned only the last is practicable; for, with the first, only a limited amount of gas could be burned; and, with the second, the entering mixture would be fired as soon as the gauze became hot.

A burner utilizing the principles of surface combustion may be so varied in design as to be applicable under widely different conditions. Extremely high temperatures are easily obtainable with this process, and it now appears that gas can be used where heretofore it was impracticable and uneconomical. For economic heating atmospheric burners may be used through only a small range of temperatures, up to about 650° F. Blast burners have made it possible to reach 3,200° F.; but with this process, providing as it does a concentration of heat, and a much higher efficiency, as well as making temperatures above 3,400° F. obtainable, the industrial gas field should be greatly widened.

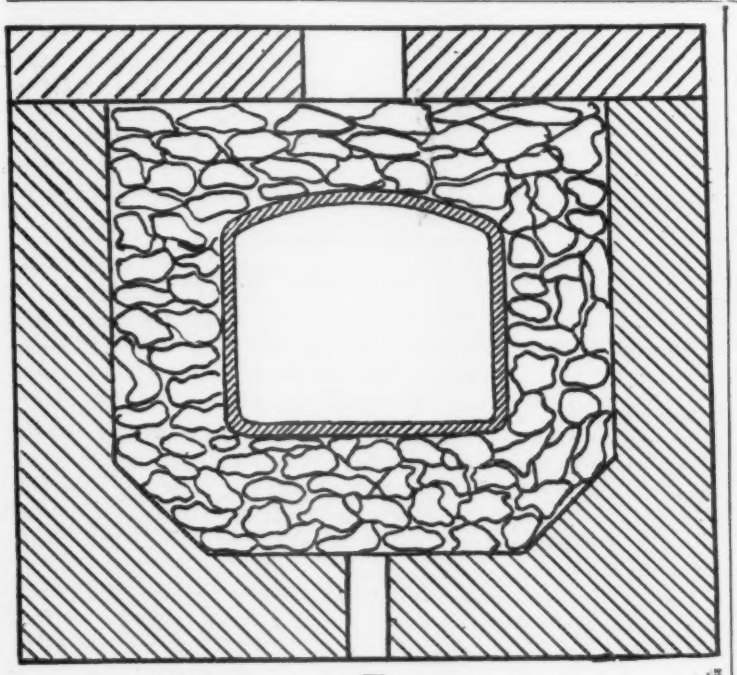
In the applications discussed by Prof. Bone we have the heating of crucible and muffle furnaces, by surrounding the crucible or muffle with crushed firebrick or other refractory material, meshed to a suitable size, the mixture burning in contact with these surfaces; also lead melting, by having the burner in a hot bath of lead, the gas burned serving to keep the lead well above the melting point, melting more lead as it is added. Also, the steam and hot water fire-tube boilers, where the tubes are packed with crushed firebrick the gas being burned in the tubes. These types of boilers, when worked out and adapted to meet existing conditions, should find many applications. The diaphragm burner, where the gas is burned without flame on the surface of a porous, refractory diaphragm, should meet with favor by reason of the precision with which temperatures may be maintained, and economical consumption of gas, together with a great concentration of radiant heat. The burner itself is made up of a block of porous, refractory material, built into a cast or sheet iron back, into which the mixture of gas and air is introduced. According to Prof. Bone these burners, after long usage, show no signs of deterioration; and they should not, as the only part affected by use is the heated surface of the porous block.

In connection with diaphragm heating it might be well to call to mind a few fundamental principles in regard to heat. As you all know, heat is transferred in three different ways, namely: Radiation, convection and conduction. Of these the last two contribute the most to the heat losses, that we commonly meet with, and if we received heat by radiation only our losses would be greatly reduced; so it is with surface combustion, and more particularly with diaphragm heating. These diaphragms are so constructed that they are portable, consequently we have a portable burner with intense radiative power that may be used for a great variety of purposes. In starting this burner and proportioning the mixture for perfect combustion, the flame retreats on to the surface and then, becoming incandescent, the flame disappears and leaves a radiant, glowing surface. Temperatures may be obtained and maintained with this burner up to 1,550°, according to the rate of supply of the mixture.

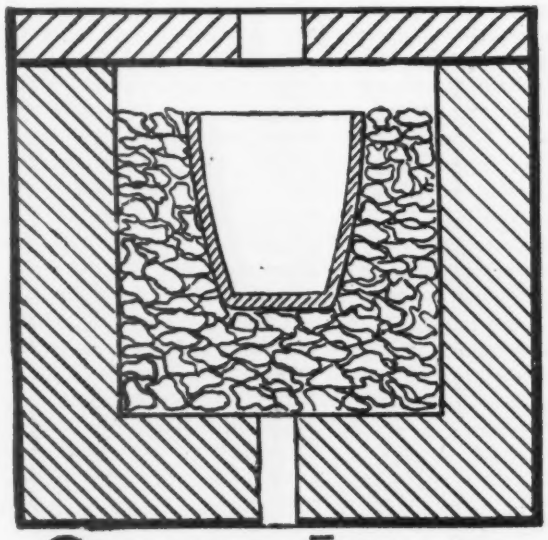
I have here a burner very similar to the one used by Bone in his lead melting surface. It consists of the pipe, as shown, and a fireclay plug with suitable orifice in the bottom of the last leg, the remainder up to the top being filled with crushed firebrick. This tube is in itself sufficient to fully illustrate the principle of surface combustion in a bed of refractory material, more particularly as applied to boilers. By starting it we find that, as the brick becomes hot, the mixture being properly proportioned, the flame strikes back to the entering orifice, but it cannot pass the orifice, however, because the velocity of the entering mixture is greater than the speed of the propagation of flame, and the gas is burned just as it expands into the region of lower pressure in the pipe containing the broken firebrick. The brick quickly becoming incandescent, the red band around the pipe shows very plainly just where the combustion is taking place. It is seen that the generation of heat takes place in a relatively small place, that the pieces of crushed firebrick in the rest of the tube serve as baffles, and the gas is relatively cooled when it leaves the tube.

Here is a miniature steam boiler, in construction similar to the one described by Prof. Bone, utilizing the principles of surface combustion. It is exactly the same as the one just described, save that the tube is surrounded by an outer casing which is partially filled with water. We see how quickly the water is raised to the boiling point.

I have here another device which will illustrate to some extent the appearance of the chamber in which surface combustion takes place. This is a 4 by 2 reducing coupling, with a plug, having a suitable orifice in the 2-inch pipe, the rest being filled with broken firebrick,



MUFFLE FURNACE



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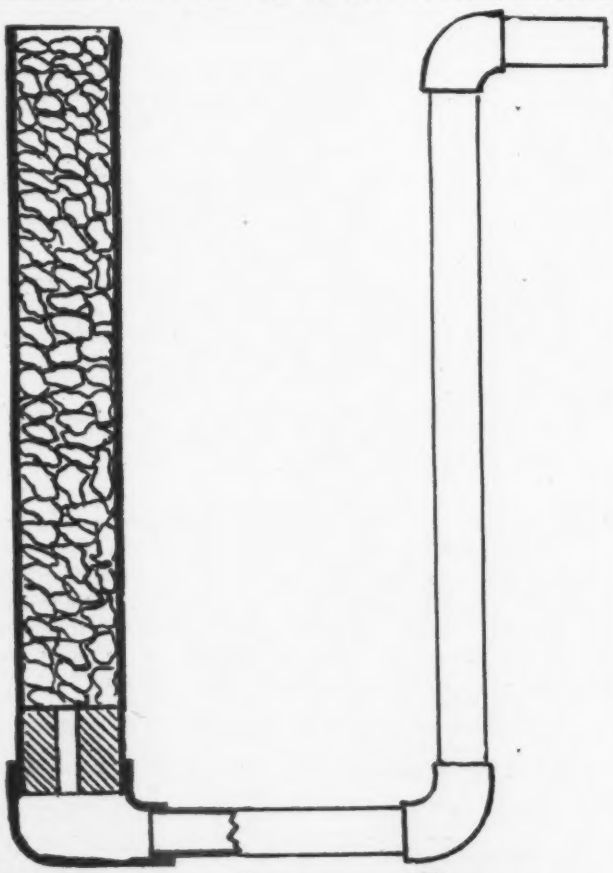
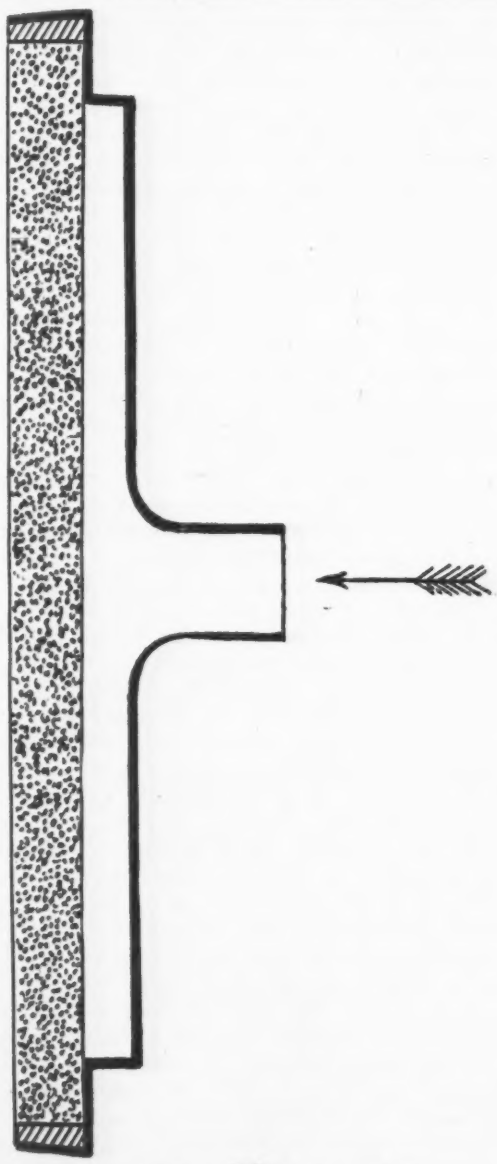


HEATER FOR LEAD BATH



DIAPHRAGM BURNER

and it may be possible with it to further illustrate the performance of flame in contact with hot surfaces.

To sum up, then, in surface combustion, we are able to burn a large amount of gas in a limited space, and the calorific power of the gas being transformed into radiant heat, a much greater efficiency than heretofore obtainable, and higher temperatures are possible; all this without elaborate apparatus. Though what little work we have done at Davenport has been largely of a preliminary nature, we are nevertheless able to see some of the possibilities of this process and believe that it will in different ways be brought gradually into use and tend toward a greater development of the gas industry.

Discussion.

Mr. Tenney—What are the highest heats obtainable?

Mr. Blackwell—Prof. Bone thinks 3,400°. He said it was very hard for him to find refractory materials that will withstand the heat he is able to get. They have some pretty good refractory materials in England, and if he is not able to find material there to withstand the heat that he is able to get, he must get 3,400°.

Mr. Vincent—I think all of us who heard Prof. Bone, in St. Louis last October, were very much impressed by his work; but I think he was mistaken in some of his statements. I understood him to say,

for example, that he got 95 per cent. efficiency on his boiler. Now, as I uuderstood it he used the so-called *net* thermal value of the gas, which is obviously wrong, as this net value is not the real thermal value of the gas at all, but some lower figure. Of course, if Prof. Bone used a figure for the thermal value of the gas lower than the true value, the apparent efficiency would be greater. I believe it perfectly possible to construct a steam generator with a water heater, burning gas in an ordinary atmospheric burner, that will give an efficiency as high as the true efficiency of Prof. Bone's boiler. To my mind the adaptation of this surface combustion is not going to be in steam at all. Apparently all that it does is to give a higher per centage of the gas burned as radiant heat. I cannot see where it is going to be of immediate use in any application of contact heating. I do not mean to throw cold water on Mr. Blackwell's efforts, but it does seem that the house heating scheme is impracticable on its face. Suppose we take an extreme case. If his gas-fired boiler has an efficiency of 100 per cent., with 600 B. T. U. gas at $1 per 1,000, then 600,000 B. T. U.'s will be applied to heating the house for each dollar spent. Now, with 12,000 B. T. U. coal at $5 per ton, burned in a domestic furnace, with an efficiency of only 50 per cent., we get 2,400,000 B. T. U.'s for $1 or four times as much as the gas.

Mr. Warnick—In thinking over Prof. Bone's statement regarding the steam boiler, I made a computation to see whether it would be practicable to use blast gases in connection with the steam generation of power plants. I figured that the charges, due to the cost of construction or the money invested, just merely on material charges alone, that, with the ordinary efficiency obtained with coal in this section of the country, it would cost about one tenth of what the gas would at $1 a 1,000; but I do think that Prof. Bone has hit on a very valuable thing for use with certain appliances, especially in melting processes. Where one now uses the acetylene process it might be possible to employ it, where we want to get high temperature and concentration of treatment in a small space.

Mr. Tenney—I would like to ask Mr. Vincent if 50 per cent. efficiency of the ordinary heating boiler is accurate. Would it not be more likely 10 or 15 per cent.

Mr, Vincent—I believe that the efficiency of an ordinary hot air furnace is about 50 per cent., possibly somewhat higher. It must be remembered that the only heat losses in domestic heating are the chimney losses.

Mr. Carson—In St. Louis I understand they are getting pretty good results from artificial gas. I understand they have one installation that is proving satisfactory, and it seems to me, when this boiler is worked out, and has the proper methods of heat regulation, it promises to sell some gas, and there may possibly be a field for it along that line.

Mr. Mettler—I would like to ask Mr. Blackwell what kind of porous stone Prof. Bone used in his diaphragm?

Mr. Blackwell—That is Prof. Bone's "own stone;" he won't tell you. He said he was a long time finding that out himself, and he didn't care about telling anybody else. While he was in St. Louis several gentlemen asked him the same question, and he said he knew what it was, but he was going to sell the right to use it in the United States.

Mr. Mettler—I asked the question because, for a number of years I was in the water filter business. The equipment of stone they use in the filtering process appealed to me as being a possible medium of transmitting the heat through on account of its porosity; and, after reading this paper over very carefully, I immediately rigged up an apparatus, placed a stone in it, as shown in the diagram, and turned natural gas into it. The gas ignited about 2 inches away from the stone, and the flame began to go down and disappear; but there was a terrific heat all the time, and the stone began to become red. When it did get red it immediately burst. For 5 years I conducted a lot of experimental work along the line of making porous stone, manufacturing it for filtration work, and during those experiments I made a very hard stone. I also used the experience that I had had in making the filter stone, and had one made up and baked. The same result took place. That was why I asked that question. Every gentleman connected with the gas business is anxious to see these things succeed, but with the small experimental work that I did I don't believe it will be possible to make a stone that will last any great length of time without breaking.

Mr. Vincent—I meant to call attention to Mr. Blackwell's suggestion about using the surface combustion for luminous signs. I thought that was the best thing I had heard of. If there is any possibility of making a sign by gas, it looks pretty good.

Mr. Blackwell—Next winter we propose heating the house of one of our men, whether he likes it or not. Don't understand that I think it is going to be more economical than coal. We are only going to experiment in order to prove that we can or can't do it. I have figured it out, and my figures show it is going to be more expensive—I don't know how much more so; but I am going to prove for myself with the actual apparatus how much more expensive it is going to be.

A New and Simple Hand Photometer.

[Prepared for the JOURNAL by DR. LEONARD K. HIRSHBERG, M. A., M. D., Johns Hopkins.]

Professor W. J. Dibdin, F. I. C., F. C. S., etc , of London, England, some years ago (in 1884 to be accurate), described a photometer which was designed for testing the light emitted by a gas jet or any other radiant, coming in all directions instead of one way, horizontally, only. That instrument was for laboratory application, and the intensity of street gas lamps had to be calculated from the results obtained in the laboratory.

The developments which have taken place in methods of illumination, in the quarter and more of a century that elapsed, call for a more direct means of measuring the intensity of light, and the calculations must be done quickly and at the fixed point of the source. Naturally, many excellent instruments for this purpose have been devised and are in general use, but it really remained for the original inventor, Prof. Dibdin, to bring to perfection the most admirable and handy device so far thought of.

Dr. Dibdin's newest invention is a small, portable hand photometer which permits quick and accurate photometric measurements to be made in every essential detail. The instrument is a trifle over 6 pounds in weight, measuring 5 inches deep, 5 inches high and 17 inches long. It is successfully designed for accuracy and convenience in comparing lights, no matter what tints or colors, and for perfect reliability, by virtue of the ease by which its readings can be checked and calculated on an open scale.

These open scale readings are obtained by the employment of some standard light or lamp. The position is read from a scale graduated in terms of "foot candles." The facility for comparing lights of varied color is obtained by the use of a form of color-disk fitted into the photometer.

To discover the illuminating power of any radiant, the square of the distance, measured in feet, from the photometer disk, is multiplied by the "foot-candle" power observed. This new Dibdin photometer will indicate up to 12 foot candles, any light at 25 feet away. This degree of illumination on the photometer scale would have an intensity of 7,500 candles, while a 1-foot candle power at the same distance would be only one one-thousandth of a candle power, the lowest for which the instrument is calibrated. The initial intensity in such a case would only be 6-tenths. From this it can be seen that this photometer has a range wide enough for ordinary gas lighting purposes, and any possible extraordinary purpose.

Recent Progress in the Measurement of Light and Illumination.

In a paper prepared by Messrs. J. S. Dow and V. H. Mackinpey, for the Optical Convention, London, June 21, the authors pointed out, steady progress in the refinement of precision in the photometrical laboratory had been made. But the most interesting feature has been the development of simple methods of measuring illumination, and the wide range of application for such instruments that is opening up. Originally, experiments were only made in the laboratory. Subsequently, tests were made of lamps in the street by travelling photometer carriages. Later still truly portable instruments were devised and are now in common use.

This branch of work is quite distinguishable from that practised in the laboratory. A certain concession as regards accuracy may be made provided convenience, portability, and ease of manipulation can be secured. In practice, it is often of small consequence whether the light varies between 5 and 10 per cent.; but it is desirable to have a means of recording whether the illumination is (say) 3 or 0.3 foot-candles, as the latter would in many cases be doubtless too little.

As an illustration of the progress in this direction, the authors re-

ferred to tests carried out in schools and libraries, and described at meetings of the Illuminating Engineering Society, and also to the experimental measurements in factories now being conducted by the Home Office. Subsequently, they described the latest form of their Holophane "Lumeter" instrument, particulars of which have been previously published. The instrument now provides for measurements to be made from 0.01 up to 2,000 foot-candles; and this enables both tests of daylight conditions and observations by night to be carried out with ease. For example, recent tests of the brightness of the night sky (often as low as 0.005 foot candle) have been made in this way; and it is suggested that observations of stars and comets might be carried out by similar means. Other instances of the value of measurements of surface brightness are afforded by the study of the reflection from various surfaces, such as wall-paper in rooms, screens used for cinematograph work, etc.

An ingenious use of measurements of reflecting power has been recently made by Mr. T. E. Ritchie, and described at a recent meeting of the Illuminating Engineering Society. The variations of the reflecting power of a series of colored ribbons by natural illumination and by various artificial illuminants were used as a means of showing which illuminant approached most closely to daylight.

As an illustration of the application of the instrument to daylight phenomena, the authors showed curves of the variations in illumination during the recent solar eclipse, which took place on April 17 last. It is interesting to observe that the illumination fell almost exactly the value which theoretical considerations would suggest. That is to say, the sun's disk was gradually obscured until 92.8 per cent. was covered, and the illumination meanwhile fell to approximately 8 per cent. of its original value.

Among other uses to which the instrument can be put, the authors mention the study of conditions of shadows. In studying rooms lighted by indirect methods, for example, it is not enough merely to record the illumination in a horizontal plane. Observations of the surface brightness of the walls and ceiling are often useful, especially in deciding how to avoid the impression of monotony which such installations sometimes appear to produce. The possible applications of measurements of reflecting power and absorption are also very great. The determination of the opacity of glasses and solutions might be very readily and accurately carried out; and it is even possible that the examination of mixed colored powders and precipitates in this way might be useful to the chemist. This is suggested by a case encountered by the authors on which samples of coal were judged by observations of their reflecting power in the form of fine powder.

It is also suggested that measurements of surface brightness might be readily applied by the physiologist to determine the conditions which tend to produce "glare"—a matter at present much in dispute. It would seem that glare besides being caused by actual brilliancy is also a matter of contrast. With the Holophane lumeter, it is possible to measure up to 2,000 foot-candles direct, and, with a little adjustment, this might doubtless be raised to 5,000 or even 10,000 foot-candles. Now this last figure is equivalent to about 20 candle power per square inch, which is well beyond the physiologist's suggested minimum intrinsic brilliancy (about 2.5 candle power per square inch). The instrument might, therefore, be applied to the direct measurement of the brightness of shades and globes in many cases.

Another instance of the value of measurements of surface brightness is in connection with photography. Simultaneous photometric observations of the brightness of various objects and their appearance, as shown by photographs, ought to be of considerable service in clearing up some disputed points. Such experimenss should also be of great value to instructors in this subject. The value of photometry as a means of judging exposure is especially great in the case of rooms lighted by artificial light, and in very dimly lit churches, etc., where actinometers cannot easily be applied.

The authors then passed on to the question of determining mean spherical candle power, and the study of the distribution of light from a source. The Ulbricht globe has proved for determining spherical candle power under certain conditions, and Dr. Sumpner has recently suggested that sufficiently accurate results for practical purposes can be obtained by substituting for this apparatus a cubical box with a whitened interior. The authors expressed doubt whether such an apparatus can be successfully used in the case of a source equipped with a highly focussing reflector. Moreover, most authorities now agree that the polar curve of light distribution should in any case be given, as well as the mean spherical candle power, in order to describe a source completely. Several ingenious methods of simplifying the calculations from polar curves have been devised; but the actual experimental practice is still somewhat laborious.

The authors have found that the time required can be shortened considerably by the new form of apparatus devised by them. This consists essentially in the means of rotating a standard card round the source investigated, and examining the brightness of this card with a Holophane lumeter. The curve is plotted out almost automatically while the experiment is in progress. For very large sources and for focussing reflectors, it has, however, now been found desirable to replace the standard card by an inclined mirror, which throws a beam on a distant test card, so as to increase the distance from the source. With this apparatus, it has been found possible to obtain a complete polar curve in 5 to 10 minutes. A method is also proposed of screening stray light from the test card, so as to enable the apparatus to be used even in a room with light walls when very great accuracy is not aimed at.

Another piece of new apparatus (which was described for the first time) is a "portable standard of light." This consists in a small tungsten lamp, fed from an accumulator packed away in a small portable case. A somewhat novel method of maintaining the voltage constant is used—namely, by having a second small carbon filament lamp, the light from which can be compared with that of the standard tungsten lamp by means of a small photometric screen in the instrument. When the instrument is correctly set, this screen is in balance. Any change in the voltage of the cells affects the lamps unequally, and throws the photometric screen out of balance. It is, therefore, immediately detected, and the voltage can be brought back to the correct value by means of a small adjustable resistance. As an additional precaution, it is proposed to employ two sets of lamps which should give concordant results. It is suggested that this portable standard will be useful for carrying about to places where complete laboratory facilities are not available for checking illumination photometers.

In conclusion, the authors made a few remarks on the courses of instruction in illuminating engineering at colleges and technical institutions. It is pointed out that the apparatus employed is not infrequently old-fashioned and primitive, and the experiments call for needless laborious calculations on the part of the student. Once the fundamental principles of measuring light and illumination are understood, this might be avoided by fuller use of the labor-saving devices now employed in practice.

The scope of such experiments is at present somewhat limited, and there are many modern problems—such as the design of shades and reflectors, indirect lighting, tests on the effect of color, etc.—which might well be studied more completely in the college laboratory. It is suggested that by the use of simpler and more convenient appliances of the type described in the paper, measurements of illumination can be popularized, and will ultimately be utilized to a much greater extent in connection with other branches of science.

Management & Commercial Methods.

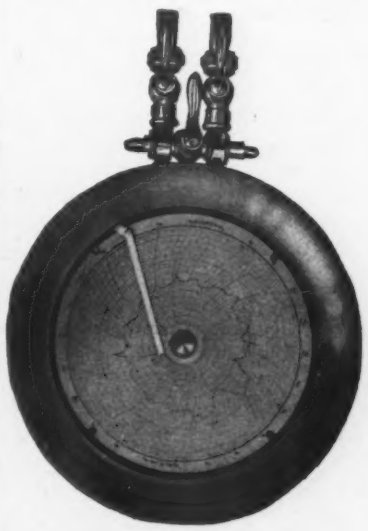


Fig. 807.

A NEW DIFFERENTIAL RECORDING GAUGE.—In Fig. 807 is illustrated a new differential recording gauge, which has just been placed on the market by the Industrial Instrument Company, Foxboro, Mass., showing the values for admission of pressures, the difference between which is to be recorded.

The moving element consists of a patented pressure tube movement, as used in Foxboro designs of improved pressure recorders. For ranges below 10 pounds per square inch, the diaphragm tube, as per Fig. 727, is employed, and for differential pressure exceeding 10 pounds per square inch, the helical tube movement, as per

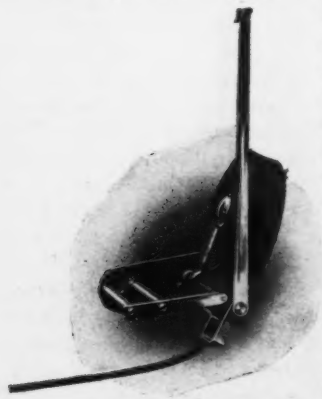


Fig. 727.

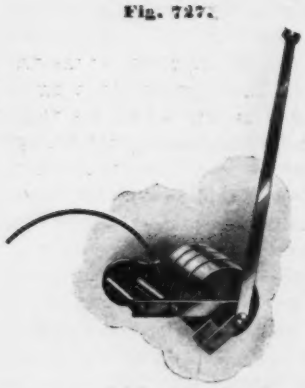


Fig. 710.

Fig. 710, is used. In both, it will be noticed that the pen arm is directly attached to a shaft giving substantial support and rigidity to the movement. A friction-joint is supplied in the pen arm, *in line of the shaft*, making adjustment possible, where necessary and without affecting the length of the pen arm.

A pressure tube of the required range, to cover the differential pressure desired, is employed; one of the two pressures, the difference between which is to be recorded, is applied internally to the pressure tube, and the other is applied externally. The principle is the same as in ordinary practice, with the difference that one pressure instead of being atmosphere is replaced by some other pressure.

Transmission from the movement to the pen arm is obtained through a special bearing through the wall of the chamber inclosing the movement. It will be readily seen there is practically no limit to the range of the difference or static pressure under which this recorder can be successfully used. It is especially adapted to measure the flow of fluids by means of Venturi or Pitot tubes. An interesting and very useful application is for recording the height of water in a boiler. Fig. 899 shows a fac-

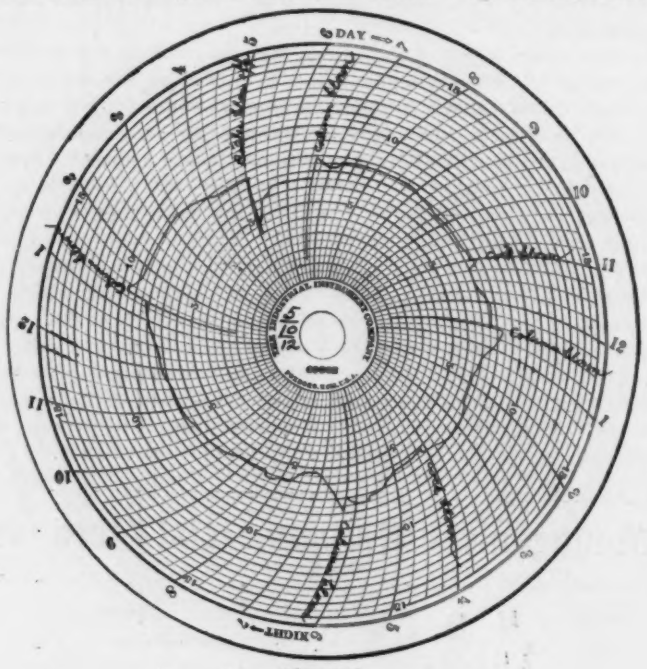


Fig. 899.

simile of chart and record, for 24 hours, of the height of water in the gauge glass of a 125-horse power, return tubular boiler, in a small electric light plant operating 24 hours per day. Applied to the water column, the recorder gives a record, not only of the height of water, but an accurate record of the time the water column or gauge glass is blown, the time with amount the boiler is blown off, and any other disturbance affecting the height of water in the gauge glass, all of which information is now generally required as a part of the engineer's records. The continuous record will induce uniform condition of water level, and be an efficient check against unsafe high or low water, insuring greater economy and safety. Disputes frequently arise when there is any trouble with water in cylinders. This recorder will show conclusively whether trouble is due to high water, or must be looked for elsewhere. The recorder may be placed at a distance from the boiler, and in case of boiler explosion place responsibility where it belongs. Such an instrument is a valuable safety and efficiency factor on any boiler. Further information can be obtained from the manufacturers.

Items of Interest
FROM VARIOUS LOCALITIES.

THAT "bloated monopoly," the Brooklyn Union (N. Y.) Gas Company, through its Flatbush branch, in conjunction with another example of the bloated type, in the Flatbush Water Works Company, have installed, at considerable expense, a "wading pond" for the public school youngsters, who have "Playground No. 3" for headquarters. The site is at Rogers avenue and Robinson street. The Gas Company provided the site and all pipe connections and the Water Company does the rest, The latter has also provided a drinking fountain. Now, what has that celebrated trio of high-class religious expounders—Messrs. or Doctors Chase, Slicer (the writer fails to remember the third one)—done for the children within the lines of their respective districts? Two of them are in Europe, and their churches are closed for the summer season. "Fie," gentlemen; to permit two bloated monopolies outdo you in charity towards the children.

THE Messrs. Storm are to be congratulated on the calm but nevertheless effective way in which they are disturbing the ancient traditions of Amarillo, Tex. Some 5 or 6 years ago they stormed the City Council of this bustling Texas spot, and established an up-to-date gas works of the water gas type. In 1910 (for instance) in January the output was 1,486,900 cubic feet; in January, 1912, the output was 2,182,600 cubic feet; and in January, 1913, it cannot be less than 3,000,000 cubic feet. Now the concern has engaged to put down 8 miles of street mains—none less than 4 inches in diameter—and it will be of use to contractors to remember that the Company will be in the market before the first of the year for a water gas set.

MR. NOBLE L. CLAY, formerly of Norfolk and Portsmouth, Va., has been appointed Manager of the Durham (N. C.) Company, succeeding Mr. R. L. Miller, who is now in charge at Raleigh, N. C.

ARROYO GRANDE, CAL., will have gas by the 5th inst. The rates agreed on are: Minimum charge, $1.35 per 1,000 cubic feet; first 2,000 per month, $1.35 per 1,000. All in excess of 2,000 per month, $1 per 1,000.

MRS. HELEN ARMSTRONG will no longer be known by that name to the many thousands of people amongst whom she will always be known as one of the cleverest of lectureses on the use of gas in the kitchen. Hereafter she will be known in life as Mrs. Eugene M. Ruggles, for, on the 18th ult., she was united in marriage to Dr. Eugene M. Ruggles, the ceremony having been performed at the home of Mr. and Mrs. James J. Armstrong, Waukazoo, Mich.

THE Gas Machinery Company, of Cleveland, O., has been authorized to construct a new water gas apparatus, together with water gas tar extractor, on the works of the Wisconsin Traction, Light and Power Company, Appleton, Wis. General Manager Ellis and Superintendent Jones, of the Traction Company's gas division, through their clever carrying on of this important branch of the Company's business, have made it a financial mainstay of the corporation.

THE Terry Steam Turbine Company has discontinued its Detroit agency, the territory east of longitude 85° having been placed in the control of the Cleveland office, with Mr. L. G. Findlay, Manager. West of that line comes the meridian with Chicago office, with Mr. A. P. Pick in charge.

IN this connection it is worth noting that 9 separate gas companies have ordered Terry turbine blower sets within a short time. The Consolidated, of this city, leads the list with an order for 210-horse power.

RECENT press advices by way of Boston, dated the 25th ult., are to this effect: "The Fall River (Mass.) Gas Works Company has applied to the Massachusetts Supreme Court for a writ of certiorari to bring up the record before the State Board of Gas and Electric Light Commission, to secure a reversal of the Board's recent decision refusing to allow the Company to issue 1,150 shares of additional capital stock for construction and additions to its plant. The Company asserts that the extra dividends to which the Commissioners call attention in their decision have been paid from earnings and that it is entitled to issue more stock for the purpose named. The decision of

the Board announced on June 15, was based on the fact that the laws of Massachusetts provide that no gas company shall declare any stock dividends or divide the proceeds of the sale of stock among its stockholders. In the last 5 years, in addition to the regular dividends of 10 per cent. per annum, the Gas Company has declared 2 extra dividends of 15 per cent. and 20 per cent. The amount is just about what it now wishes to issue stock for. The Board said in its decision that if the Company can do this it not only compels the public to contribute all the additional investment required for the payment, but also may have this contribution permanently represented by capital stock upon which the public must pay such dividends forever."

THE City Council, of Waycross, Ga., after much debate (sometimes the argument resembled a "wrangle") has granted to Mr. George W. Deen, of Waycross, and Mr. L. M. Aldrich, of New York, a franchise for the construction and operation of a gas plant in the place named. The agreements include this: The life is 33 years; the initial selling rate is $1.35 per 1,000 cubic feet, with 10 per cent. off for payment within 10 days; a bond of $2,500 to be filed upon acceptance of the franchise, and to be forfeited if work is not actually begun on the gas plant within 6 months after the contract is signed, such work being bound to be completed within 18 months. The right to renew the franchise on its expiration remains within the grant of the City Council. In return for this presenting the city is to receive 1 per cent. of the Company's gross revenue for the first 5 years; 2 per cent. for second 5 years; thereafter, and until the expiration of the grant, 3 per cent. The grantees propose to construct a plant fully up to any other works in the South, and also proposes to do so forthwith.

"B. V. M.," writing from Tampa, Fla., under date of the 28th ult., remarks: "The Tampa Gas Company Boosters' Association recently held its annual reunion. The election of office bearers resulted as follows: President, T. L. McShane; Vice-President, T. J. Smith; Financial Secretary, D. P. Galvin: Recording Secretary, K. Simons. Roscoe Nettles, the all-pervading Manager of the Gas Company, has fitted up a fine club room and gymnasium for the boys; and about the spryest man on the bars thereof is the aforesaid Manager."

"T. L. L.," writing from Dover, N. H., the 28th ult., says: "I regret to inform you of the death of Mr. James Madison Meloon, father of Mr. W. G. Meloon, General Manager of the Twin State Gas and Electric Company. Deceased, who was in his 79th year, was a native of Newcastle, in which town he was an influential factor, having served it well in many ways. He is survived by his widow, 2 sons and 2 sisters."

AT last the settlements of Grand View, Piermont, Sparkill and Tappan, N. Y., all in Rockland county, are to have a gas supply. If we mistake not the supply will be laid on from the Nyack plant.

HERETOFORE the Logan Gas Company has charged a meter rate of 10 cents per month for gas supplied by it in Fremont, O.; but the charge was ordered discontinued the 1st inst.

THE Colliers Light, Heat and Power Company, to supply gas and electric currents in the vicinity of Colliers, Otsego county, N. Y., has been incorporated by Messrs. Louis B. Grant, B. T. Cavanagh, Peter T. Schutrum and Arthur McCausland. It is capitalized in $50,000.

"B. V.," informs us that the Schneider estate is no longer interested in the Dallas (Tex.) Gas Company, his widow having recently disposed of the estate holdings to those operating the Company as at present constituted.

MR. CELESTINE C. BURNS, President of the Watertown (N. Y.) Light and Power Company, has been authorized by the Directors to supply gas through a high pressure line to the outlying settlement of Carthage.

"M. L. M.," writing from Norristown, Pa., under date of the 25th ult., incloses this statement, which evidently was prepared for the "Associated Press:" "A development of much importance to the business world of the State of Pennsylvania has been registered through the merging of many light and power companies in Montgomery county. The Companies (they are consolidated under the title of the Counties Gas and Electric Company) are: Marion and Radnor Gas and Electric, Conshohocken Gas, West Conshohocken Gas, Plymouth Electric, Lower Providence Electric, West Norristown Electric, East Norristown, Whitpain Electric, Tredyffrin Electric, Upper Marion Electric, Trappe Electric, Collegeville Electric Light, Heat and Power, and Montgomery County Gas. The consolidated concern owns all the assets and assumes all the obligations of the merged concerns, and that it will supply gas and electricity in the Schuylkill Valley, Lower Marion and Main Line section. It is asserted there will be no change in the character of the service or in the personnel of the official and executive staffs. The chief executives as agreed upon initially are: President, Mr. Samuel T. Bodine —President United Gas Improvement Company; Vice-President, Mr. Jno. D. McIlhenny, formerly in control of the Norristown Companies.

THE output of the Detroit City (Mich.) Gas Company has reached the point where it virtually exceeds 4 billions cubic feet per annum. This is seen from comparing the semi-annual report for the half year from December 31, 1911, to July 1, 1912, in which time the output was: Detroit (city proper), 1,981,022,300 cubic feet; suburbs (within city limits), 65,707,400. If the output for the latter half of the year (to December 31, 1912) is equal to the former half (and there is no doubt that it will well exceed it) the output for the twelvemonth will well exceed 4 billions cubic feet.

THE revenues af the Kansas City (Mo.) Gas Company for the half year ended June 30 last were $1,444,992.48 Under the 2 per cent. royalty agreement the city's portion of this amounts to $28,899.

THE Standard Gas and Electric Company, the holding concern for that exceedingly well-managed corporation (H. M. Byllesby & Co.), reports earnings of $1,919,052 for its fiscal year ended June 30th. This enabled a payment of 8 per cent. on the preferred stock; and $726,900 was passed on to surplus.

MR. F. L. MARSHALL has been appointed General Manager of the Henrico County (Va.) Gas and Electric Company. He was connected with the Hampton and Phœbus Companies.

THE Northumberland County (Pa.) Gas and Electric Company has organized a new business and commercial division, under the direction of Mr. Joseph L. Matheas, formerly of the American Gas Company. His headquarters will be in Sunbury, Pa. He is a good man, whose work is not of the time serving sort.

THE Board of Public Utilities, State of New Jersey, being governed in its decision by the bare text of the law, and expressly regretting the circumstances that obliged it, finally decided, in the matter of petition against the right of the City Gas Light Company, of Ocean City, N. J., to charge a minimum monthly sum for account as a running charge, that: "A fair minimum guarantees a return on plant built, maintained and held in readiness to serve. A fair charge for the amount of gas consumed affords a return for the second class of expenses. A proper schedule will combine both a minimum charge and a metered consumption charge, and is fairer and more advantageous in the long run to both consumer and producer than the ordinance provision now operative in Ocean City." There was no relief for the Company, owing to the nature of the operating ordinance, which specified that no charge for gas should be made other than the charge specified in its paragraphs.

THE proprietors of the Sheboygan (Wis.) Gas Light Company have petitioned the Railroad Commission of the State for a rehearing, basing the claim on the fact that the cut ordered was too radical. Also, that the Company had gathered new testimony in support of its contention.

THE Blau gas process manufactory at St. Paul, Minn., was successfully put in operation some days ago. It cost $100,000 to construct, and is located on Charles street, junction of Hampden avenue. It is up to producing and storing 300 "bottles" per day—carrying 20 pounds to the bottle.

THE Gas Machinery Company, of Cleveland, O., has been awarded contracts for silica retorts and settings, to be installed in the gas works at Waterloo, Ia., and Ishpeming, Mich.

A CORRESPONDENT in Boston states that the gas rate at or in Chicopee, Mass., will be reduced to $1 per 1,000, net, as soon as the formalities connectrd with the consolidation of the Chicopee Gas Company with the Springfield Gas Light Company are concluded.

The Market for Gas Securities.

Consolidated shows no change in quotations, as between the opening last Friday and this. The figures to-day are 144¾ to 145; last Friday they were 144½ to 145. The dealings were on a small scale, and nearly all for cash. Another odd thing has developed in the trading, in that it is seldom the public, of the small fry order, goes in for stocks selling at par-and-a-half. But in the last 4 months the writer has knowledge that one odd-lot dealer has sold 20 customers a total of 160 shares. In these transactions the minimum was 1 share, the maximum 12 shares. This would indicate that people on the payrolls of the Company are investing in its stock. And a better thing they could not do.

Brooklyn Union shows a substantial gain, being quoted to-day at 146¾ bid, as against 145 bid last week. One big insurance company laid away quite a block of Brooklyn Union last week, the deal not being made through the Exchange. Peoples, of Chicago, maintains its advance; but it still quotes very much below its value. The industrial division of this concern is growing in amazing way.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

115 BROADWAY, NEW YORK CITY.

AUGUST 5.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share:

N. Y. City Companies.	Capital.	Par.	Bid.	Asked
Consolidated Gas Co.	$78,177,000	100	144¼	145
Central Union Gas Co.—				
1st 5's, due 1972, J. & J.	3,000,000	1,000	108	106
Equitable Gas Light Co.—				
Con. 5's, due 1932, M. & S.	1,000,000	1,000	105	106
Mutual Gas Co.	3,600,000	100	190	245
New Amsterdam Gas Co.—				
1st Con. 5's, due 1948, J. & J.	11,000,000	1,000	101	102½
New York & Richmond Gas				
Co. (Staten Island)	1,500,000	100	35	50
1st Mtg. Gold Bds. 5 p. ct.	1,500,000	—	98¼	100½
New York and East River—				
1st 5's, due 1944, J. & J.	3,500,000	1,000	103	105
Con. 5's, due 1945, J. & J.	1,500,000	—	95	100
Northern Union—				
1st 5's, due 1927, J. & J.	1,250,000	1,000	100	109
Standard	5,000,000	100	60	70
Preferred	5,000,000	100	90	100
1st Mtg. 5's, due 1930, M. & N.	1,500,000	1,000	103	105
The Brooklyn Union	15,000,000	1,000	146¾	148
1st Con. 5's, due 1948, M. & N.	15,000,000	—	106¾	107
Yonkers	299,650	500	130	—
Out-of-Town Companies.				
Bay State	50,000,000	50	⅛	⅝
" Income Bonds	2,000,000	1,000	—	75
Binghampton Gas Works	450,000	100	—	—
" 1st Mtg. 5's	500,000	1,000	97	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	5	8
Bonds, 5's	5,250,000	1,000	59	60
Capital, Sacramento	500,000	50	—	85
Bonds (6's)	150,000	1,000	—	—
Chicago Gas Co. Guaranteed				
Gold Bonds	7,000,000	1,000	104	106¼
Cincinnati Gas and Electric				
Co.	20,500,000	100	87	90
Columbus (O.) Gas Co., 1st				
Mortgage Bonds	1,500,000	1,000	96	98
Columbus (O.) Gas Lt. &				
Heating Co.	1,662,750	100	90½	91
Preferred	3,036,500	100	75½	80
Consumers, Toronto	2,000,000	50	200	204
Consolidated, Baltimore	13,460,084	—		—
Mortgages, 5's	3,400,000	—		—
General Mortgage 4½	10,661,000	—		—
Con. Gas Co., Baltimore				
City, 4½	2,751,000	—		—
Consolidated Gas Co. of N. J.	1,000,000	100	15	—
Con. Mtg. 5's	976,000	1,000	94	96
Bonds	75,000	—	—	100
Detroit City Gas Co.	6,580,000	—	—	50
Detroit Gas Co., 5's	881,000	1,000	75	80
" Prior Lien 5's	5,619,000	1,000	97	100½
Equitable Gas & Fuel Co.,				
Chicago, Bonds	2,000,000	1,000	—	101
Essex and Hudson Gas Co.	6,500,000	—	183	186
Fort Wayne	2,000,000	—	—	—
" Bonds	2,000,000	—	55	—
Grand Rapids Gas Light Co.,				
1st Mtg. 5's	1,350,000	1,000	100	101
Hartford	750,000	25	190	200
Hudson County Gas Co., of				
New Jersey	10,500,000	—	135	138
" Bonds, 5's	10,500,000	—	101	105
Indianapolis	2,000,000	—	—	38
" Bonds, 5's	2,650,000	—	104½	105
Jackson Gas Co.	250,000	50	82	—
" 1st Mtg. 5's	290,000	1,000	91	95
Kansas City Gas Light Co.,				
of Missouri	5,000,000	100	—	36
Bonds, 1st 5's	3,822,000	1,000	99	102
Laclede Gas Co., St. Louis.	10,000,000	100	106¼	106½
Preferred	2,500,000	100	90	100
Bonds	10,000,000	1,000	102¾	103
Lafayette Gas Co., Ind.	1,000,000	100	—	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	120	170
Madison Gas and Electric Co.				
" 1st Mtg. 6's	400,000	1,000	106	
Massachusetts Gas Companies, of Boston	25,000,000	100	89½	F95¼
Preferred	25,000,000	100	95	95½
Montreal Gas Co., Canada	9,000,000	100	233	236
Nashville Gas Light Co.	1,000,000	100	110	—
Newark, N. J., Con. Gas Co.	6,000,000	—	97	98
Bonds, 6's	6,000,000	—	127	128
New Haven Gas Co.	5,000,000	25	189	190
Peoples Gas Lt. & Coke Co.,				
Chicago	25,000,000	100	116½	116¾
1st Mortgage	20,100,000	1,000	102	102½
2d "	2,500,000	1,000	104	—
Rochester Gas & Electric Co.	2,150,000	50	88	—
Preferred	2,150,000	50	118	—
Consolidated 5's	2,000,000	—	104¾	105½
Pacific Gas and Electric Co.	15,500,000	—	66½	67
St. Joseph Gas Co.—				
1st Mtg. 5's	1,000,000	1,000	96	98
St. Paul Gas Light Co.	2,500,000	100	—	—
1st Mortgages, 6's	650,000	1,000	104	106
Extension, 6's	600,000	1,000	112¾	115
General Mortgage, 5's	3,447,000	1,000	94	96
Syracuse Gas Co., N. Y.	1,975,000	100	50	55
Bonds	2,047,000	1,000	101	103
Washington (D. C.) Gas Co.	1,500,000	200	420	425
1st Mortgage, 6's	600,000	—	—	—
Western Gas Co., Milwaukee	4,000,000	—	—	—
Wilmington (Del.) Gas Co.	600,000	50	—	—

MEETING TIMES OF THE VARIOUS GAS ASSOCIATIONS.

American Gas Institute.—Annual meeting, October 16 to 18, 1912. Marlborough-Blenheim Hotel, Atlantic City, N. J. Officers: President, Ira C. Copley, Aurora, Ills. Secretary, Geo. G. Ramsdell, 29 West 39th st., N. Y. City.

Canadian Gas Association.—Annual meeting and Gas Show, Toronto, Aug. 26th to Sept. 7, 1912. Officers President, Arthur Hewitt, Toronto, Ont.; Secretary and Treasurer, John Keilior, Hamilton, Ont.

Empire State Gas and Electric Association.—Annual meeting, New York City, Oct. 1912. Officers: President, R. M. Searle, Rochester, N. Y.; Secretary, C. H. B. Chapin, 29 W. 39th street, New York City.

Gas Meters.—Monthly meetings. Chairman, Will W. Barnes; Commissioners, W. H. Pettes, I. W. Peffly; Secretary, H. Thurston Owens, 42 Pine street, New York City.

Gulld of Gas Managers of New England.—Annual meeting, March, 1913. Young's Hotel, Boston; monthly meeting, second Saturday. Officers: President, Walter G. Africa, Manchester, N. H.; Secretary, H. K. Morrison, Brockton, Mass.

Illinois Gas Association.—Annual meeting, March 19th and 20th, 1913. Chicago, Ills. Officers: President, H. O. Channon, Quincy, Ills.; Secretary-Treasurer, Horace H. Clark, 115 No. Oak Park avenue, Oak Park, Ills.

Illuminating Engineering Society.—Annual meeting, Niagara Falls, Canada, Sept. 16-19, 1912. Meetings of Sections, monthly. Pres't, V. R. Lansingh, New York City; Secretary, Preston S. Millar, 29 W. 39th street, N. Y. City. Sections: New York, Secretary, C. L. Law, 124 West 42d street. New England, Secretary, H. C. Jones, 10 High street, Boston, Mass. Philadelphia, Secretary, L. B. Eichengreen, Broad and Arch streets. Chicago, Secretary, J. B. Jackson, 28 North Market street. Pittsburgh, Secretary, J. C. Mundo, Oliver Building.

Indiana Gas Association.—Annual meeting, March, 1913, Indianapolis. Officers: President, Howard L. Olds, Indianapolis; Vice-President, Wm. Wallace, Lafayette; Secretary-Treasurer, Philmer Eves, Indianapolis.

Iowa District Gas Association.—Annual meeting, Burlington, Ia., May, 1913; Officers: President, C. W. Fair, Atlantic, Ia.; Secretary, G. I. Vincent, Des Moines, Ia.

Kansas Gas, Water and Electric Light Association.—Annual meeting, October 17-19. Manhattan, Kas. Officers: President, B. F. Eyer, Manhattan, Kas.; Secretary and Treasurer, J. D. Nicholson, Newton, Kas.

Michigan Gas Association.—Annual meeting, September 4-6, 1913; Toronto, Canada. Officers: President, F. W. Blowers, Kalamazoo, Mich; Secretary-Treasurer, Glenn R. Chamberlain, Grand Rapids, Mich.

Missouri Electric Light, Gas, Water Works and Street Railway Association.—Annual meeting, April, 1913; Joplin, Mo. Officers: President, P. A. Bertrand, Joplin, Mo.; Secretary and Treasurer, P. W. Markham, Brookfield, Mo.

National Commercial Gas Association.—Annual meeting and Gas Show, Dec. 2-5, 1912. Atlanta, Ga. Officers: President, C. L. Holman, St. Louis, Mo.; Secretary, Louis Stotz, 29 West 39th street, New York City.

Natural Gas Association.—Annual meeting, Cleveland, O., May, 1913; Officers: President, M. B. Daly, Cleveland, O; Secretary, T. C. Jones, Delaware, O.

New England Gas Association.—Annual meeting, February,———1913 Boston. Officers: President, D. D Barnum, Worcester, Mass.; Secretary-Treasurer, N. W. Gifford, East Boston, Mass.

New Jersey State Gas Association.—Summer Meeting. Sept. 21, Atlantic City, N. J.—President, William H. Pettes, Newark, N. J.; Secretary-Treasurer, Arthur H. Osborn Belmar, N. J.

Ohio Gas Association.—Annual meeting, February ———, 1913, Columbus, O.; President, John M. Garard, Columbus, O.; Secretary, L. B. Denning, Columbus, O.

Oklahoma Gas, Electric and Railway Association.—Annual meeting, May, 1913. President, Noel R. Gascho, Alva, Okla.; Secretary, H. V. Bozell, Norman, Okla.

Pacific Coast Gas Association.—Annual meeting, San Diego, Cal., September 17, 18, 19, 1912. Officers: President, W. Baurhyte, Los Angeles, Cal.; Vice President, Henry E. Adams, Stockton, Cal.; Secretary-Treasurer, John A. Britton, 445 Sutter street, San Francisco, Cal.

Pennsylvania Gas Association.—Annual meeting, York, Pa., April, 1913; Officers, President, H. H. Ganser, Norristown, Pa.; Secretary-Treasurer, W. O. Lamson, Jr., West Chester, Pa.

Society of Gas Lighting.—Annual meeting Dec., 13, 1912; monthly meetings, second Thursday. Place, New York City. Officers: President, Fred. S. Benson; Secretary, George G. Ramsdell, 29 West 39th street, New York city

Southern Gas Association.—Annual meeting, April ——— 1913, Charlotte, N. C. Officers: President, C. E. White, Montgomery, Ala.; Secretary-Treasurer, E. D. Brewer, Atlanta, Ga.

Southwestern Electrical and Gas Association.—Annual meeting. April———1913, Galveston, Tex. Officers: President, F. M. Lege, Jr Dallas, Tex.; Secretary, H. S. Cooper, Galveston, Tex.

Wisconsin Gas Association.—Annual meeting, May ——— 1913, Milwaukee, Wis. Officers: President, I. F. Wortendyke, Janesville, Wis.; Secretary-Treasurer, Henry Harmon, Milwaukee, Wis.